JAS. P.
MARSH
& COMPANY

Marsh
Heating
Systems

JAS. P. MARSH & COMPANY

ESTABLISHED 1865

2073 SOUTHPORT AVENUE
CHICAGO, ILL.

DIVISION OF
COMMERCIAL INSTRUMENT CORPORATION

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Marsh System Units T.M. REG.
Marsh Heating Systems T.M. REG.
Marsh Industrial Instruments T.M. REG.

INTRODUCTORY

In presenting this latest edition of the Jas. P. Marsh & Company heating catalogue to our many friends in the heating industry, we do so in the hope that our endeavor to introduce the new and modern heating specialties shown herein will meet with the same spontaneous approval that has been accorded Marsh products in the past.

It has always been the policy of Jas. P. Marsh & Company to meet the ever-increasing demand for efficient heating and industrial specialties. Our engineering and design departments are continually striving to attain this end.

We are always at your service in an endeavor to assist you in solving your problems and welcome the opportunity of co-operating with you.

THE SCOPE OF THIS CATALOGUE

This catalogue is designed for the use of architects, contractors and heating engineers. The material herein has been organized around the various systems of heating made up of Marsh System Units. To that end, the bulletins embodying data on each system have been made complete. In addition to a thorough description of the function and operation of each system, complete data is given on all the Marsh System Units composing it. Separate bulletins are also included on valves and traps which represent the most important parts of each system. There is also a bulletin on Marsh Gauges and Instrument Panels.

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GENERAL INDEX

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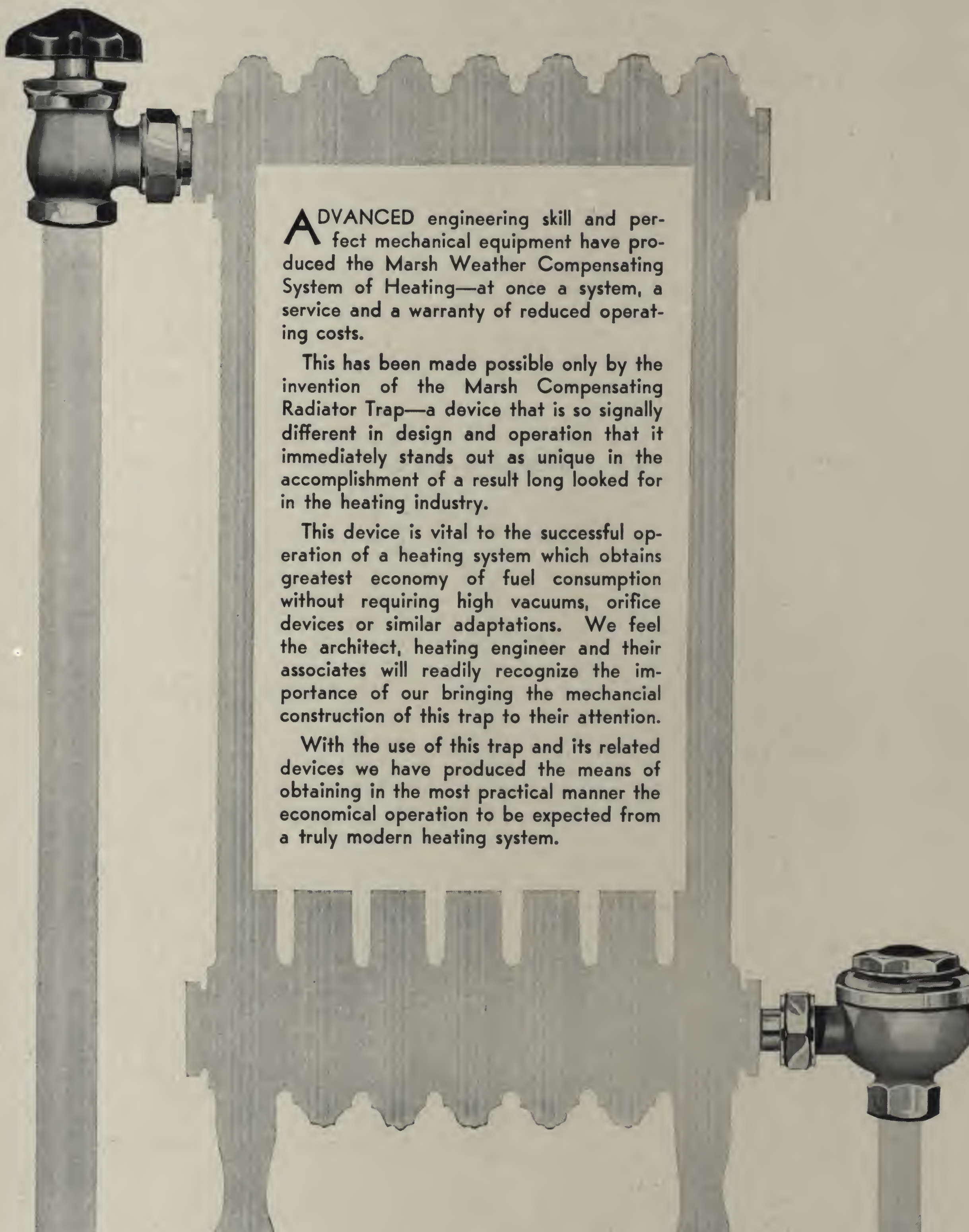
THE MARSH
WEATHER COMPENSATING SYSTEM
OF HEATING

Bulletin
No. 50

for
Apartment
Commercial
and
Public
Buildings

JAS. P. MARSH & COMPANY
CHICAGO



ADVANCED engineering skill and perfect mechanical equipment have produced the Marsh Weather Compensating System of Heating—at once a system, a service and a warranty of reduced operating costs.

This has been made possible only by the invention of the Marsh Compensating Radiator Trap—a device that is so signally different in design and operation that it immediately stands out as unique in the accomplishment of a result long looked for in the heating industry.

This device is vital to the successful operation of a heating system which obtains greatest economy of fuel consumption without requiring high vacuums, orifice devices or similar adaptations. We feel the architect, heating engineer and their associates will readily recognize the importance of our bringing the mechancial construction of this trap to their attention.

With the use of this trap and its related devices we have produced the means of obtaining in the most practical manner the economical operation to be expected from a truly modern heating system.

THE MARSH

WEATHER COMPENSATING SYSTEM

OF HEATING

Preamble

FOR the past decade, heating engineers the world over have been attempting to produce a means of preventing the waste of heat in buildings. Heretofore, steam has been delivered to the radiators at a constant pressure and volume, regardless of the amount of heat necessary to meet the requirements of varying outside temperatures, resulting in a needless waste of fuel.

In order to heat a building properly, a given amount of radiation is installed to overcome the amount of heat which is lost, that is, the amount of heat which passes through the inside walls, through windows, doors and cracks, into the outside atmosphere. This amount of radiation is carefully calculated to meet the severest weather conditions to maintain a comfortable temperature within the building, usually based upon an operating steam pressure ranging from 1 to 3 pounds gauge. But, while sufficient radiation has been installed to heat the building to a comfortable temperature during severe cold weather, no provision has been made to meet the heat demands of mild spring and fall weather when but little heat is required to balance the heat loss of the building.

Accordingly, when the weather is mild the system delivers too much heat. Unless some means is provided to restrict the amount of heat delivered to a radiator, which the radiator in turn delivers to the room, the rooms are overheated and a resultant fuel waste occurs. This means of control in its simplest form lies in placing individual shut-off valves on each radiator. That simple means would be effective provided the occupants of the room would operate those valves, closing them entirely and opening them as the demand required or by so partially closing a gradual type of valve as to permit only a restricted amount of steam to pass into each radiator. That we know the individual occupant cannot be depended upon to do.

Expensive Remedies

Of course, there are available a number of means of automatically controlling individual rooms only. However, the more efficient ones are very costly to install in a new building, and almost prohibitive for placement in an existing structure. Maintenance is likewise very expensive.

Under ideal operating conditions such controls usually function to maintain temperatures. However, it is possible for the occupant of a room so controlled to nullify the effect of the thermostatic control of a radiator by opening a window, thereby permitting the radiator to deliver its full capacity of heat. This weakness, plus the first cost of these methods, makes their contribution to economy only a small percentage of the normal waste.

Fuel Waste

The result is that the rooms are overheated. Generally, this condition is met by the occupant, who, upon sensing the overheated condition of the room, proceeds to open a window to lower the temperature of the room. Consequently, the heat produced by the radiator passes to the outside and fuel is wasted.

In rare cases, such a condition is overcome by the operating engineer, who must give his entire time to the heating system in order to regulate the fire in the boiler to generate only sufficient steam to supply the demand for heat to correspond to existing weather conditions. However, even though the operating engineer regulates the firing of a boiler, there are conditions that cannot be governed at the source of generation.

It is a common occurrence for the outside temperature to rise or drop to a noticeable degree in an hour, due to a change in direction or increase in velocity of wind movement. In an ordinary vacuum system, the engineer cannot regulate the volume or temperature of steam intended to meet the heat demand in a building where one side of the building is subjected to the heat-giving rays of the sun, nor can he regulate the amount of steam to be supplied to the opposite side of the same building which is shaded from the sun and possibly subjected to a brisk wind, which in the latter case would require more heat than the side favored with sun rays.

The engineer will, however, govern the generation of steam to supply the heat demand of that portion of the building where the most heat is required, which in this instance would be the shaded side. The ultimate result is the overheating of the sunny side of the building.

The U. S. Weather Bureau publishes data on outside temperatures for various localities throughout the United States which will indicate that heat is required 210 to 240 days out of the entire year, depending upon the locality. Of this period,

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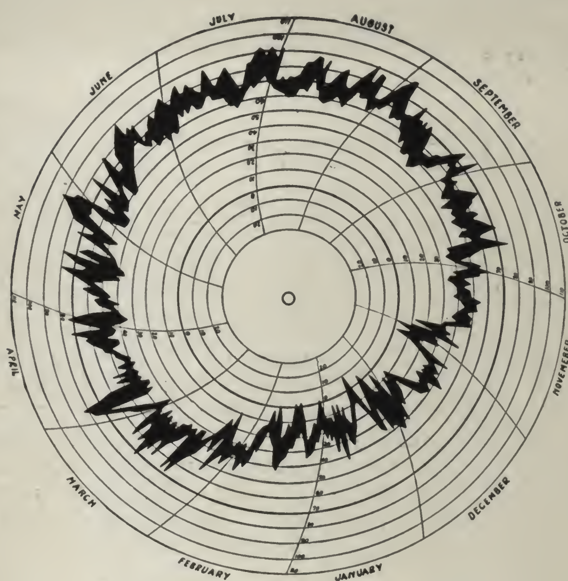

Fig. 1
1929-1930 Temperature Chart of Chicago Area

weather reports indicate that but 5 per cent is subjected to severe weather conditions that demand a maximum heat load, while heat may be supplied well under maximum heat load for the remaining 95 per cent of this period (see Fig. 1).

During the latter named period, the engineer operating an ordinary vacuum system is obliged to supply steam to the radiators in the building at practically the same temperature and volume as he does when the outside weather demands a maximum heat load. It is during this period that the engineer should be able to effect a fuel saving, had he the means to do so.

The Marsh Weather Compensating System

In the Marsh Weather Compensating System of Heating, this is not only feasible, but has also been proven practical on so many occasions that it is the most modern fuel saving system on the market today.

The Marsh Weather Compensating System of Heating accomplishes its results by compensating the volume and the temperature of the steam in the entire heating system and by limiting the amount of steam which each radiator can consume—all in accordance with weather requirements. This eliminates the waste of heat that results when a window is permitted to remain open more than is required by the need of ventilation.

The Marsh Weather Compensating System is a two pipe vacuum system similar in most points to the ordinary return line vacuum system. Steam may be supplied either by means of a boiler as the generating unit, or from an outside source. As in the ordinary vacuum system of heating, a vacuum pump is employed to create circulation and to withdraw the water of condensation from the system and return it to the boiler or steam supply unit.

Compensating Control

In the main supply system is placed a Marsh Compensating Supply Control which can be operated manually, semi-automatically or thermostatically fully automatic as desired. This control governs the pressure (or vacuum) and regulates the amount and temperature of the steam distributed throughout the system. On manually operated compensating control this is done by means of a lever and weight—on the semi-automatic, by means of a thermostatically controlled motor valve in conjunction with a similar lever and weight that requires, at the most, six or eight simple adjustments during the entire heating season. For full automatic control, a series of thermostats operates a motorized valve.

The temperature of the steam (and therefore the volume of radiator space which a given amount of steam will fill), which governs the heat output of a radiator, is thus regulated according to prevailing weather conditions.

Considering the benefits derived, the cost of the Marsh Weather Compensating System of Heating beyond that of the conventional return line vacuum system is nominal. The total cost of installation, including all materials and labor, will be but very little over that of the standard type of return line vacuum system, depending upon the type of Marsh Weather Compensating System selected.

A Guarantee of Economy

JAS. P. MARSH & COMPANY *guarantees (with a satisfactory warranty) that the total fuel consumption will be at least 25 per cent less than the amount of fuel or steam consumed by a standard vacuum system of heating. The yearly savings are equivalent to approximately the entire difference in cost between a Marsh Weather Compensating System of Heating and the standard vacuum system.*

Installed in a new building, it will yield to the owner a return of from not less than 50 to 100 per cent per year on the additional investment. Installation in an existing structure necessitates the removal of certain of the old style valves and somewhat increases the cost. However, even in such case the total cost does not exceed such an amount that will net the owner a yearly return of at least 33⅓ per cent on his investment.

The installation of a Marsh Weather Compensating System of Heating includes our engineering service, expert supervision of installation and operation, and guaranteed care for a period of five years. During that period JAS. P. MARSH & COMPANY will supervise the operation of the heating system and will maintain and service the equipment at no expense to the owners.

While the written guarantee is for a period of five years only, the entire system—including the component devices—is good for the life of the building in which it is installed.

Where desired, arrangements can be made with JAS. P. MARSH & COMPANY for additional period maintenance at a nominal yearly fee.

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Elementary Principles upon Which the Marsh Weather Compensating System Is Based

Effect of Altitude upon Boiling Points of Water

The air surrounding us has weight and exercises a pressure (14.7 pounds per square inch at sea level and 32° F.), and because of that weight, it exercises a very definite pressure upon every surface with which it is in contact. It is due to this force that water at sea level will not boil until a temperature of 212° F. has been reached, while at a higher altitude where the force of the atmosphere is less, water will boil at a much lower temperature. Citing Denver as an example, which is at an altitude where the force of the atmosphere is less, water will boil at a much lower temperature. Denver is at an altitude of approximately 5280 feet (24.45 inches mercury barometer) above sea level. Water will boil at a temperature approximately 201° F., while at sea level (29.92 inches mercury barometer) water boils at 212° F.

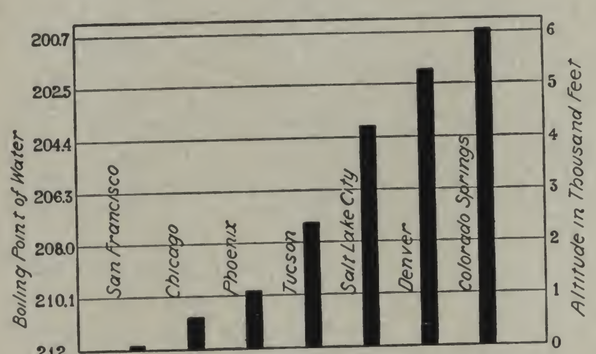

Fig. 2
Showing Difference in Boiling Points of Water at Different Altitudes

Effect of Atmospheric Pressure upon Boiling Points of Water

It was not until the invention of the vacuum pump that the theories set down by Torricelli* were put into use so far as heating systems were concerned. In 1882 an engineer conceived the idea that by reducing the pressure of the atmosphere contained in a heating system, water would boil at a lower temperature. Consequently, a pump was constructed having a unit rotating upon an axis, and by means of this rotating unit, air was expelled from the system, or as it is commonly known today, "created a vacuum." By removing the air from the system, the force of the atmosphere upon the surface of the water in a steam generating unit was reduced, allowing water to boil at a lower temperature. And since a given amount of air is removed from this unit, steam is allowed to expand to replace the space taken up by air, hence, it is generally known that a greater volume of steam can be generated from one pound of water under vacuum than can be generated at atmospheric pressure, or above.

*In 1644, Torricelli, an Italian physicist, constructed the first mercury barometer after experiments with atmospheric pressure on water.

Effect of Pressure upon Volume and Temperature of Steam

The effect of pressure upon volume and temperature of steam may be visualized by referring to Fig. 2. The temperature at which water will boil depends entirely upon the pressure exerted upon the surface of the water, likewise, volume of the steam also depends upon pressure, whether from a foreign source or created by the steam itself.

For example, assume that a quantity of water is placed in a closed vessel, and that a pressure of 1 pound per square inch has been induced into the vessel from an outside source. With sufficient heat applied under the vessel, the liquid would not boil and start forming into steam until a temperature of 215° F. had been reached, and when the entire 1 pound of water had been evaporated into steam, this steam would occupy a space equal to 25.2 cubic feet as indicated by "A," Fig. 3. If the pressure in the same vessel is reduced to 0 pound or atmospheric pressure, water would evaporate into steam at 212° F., and the pound of water entirely evaporated into steam would as steam occupy a space of 26.79 cubic feet as in "B." Had the pressure in the vessel been reduced from 0 pound to 5 inches of vacuum (2.457 pounds absolute below atmospheric pressure) evaporation would have taken

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place at 202.92° F. and the steam generated from 1 pound of water would occupy a space equal to 31.77 cubic feet as indicated in "C," and by further reducing the pressure to 15 inches of vacuum, water would have evaporated at 178.91° F., the space occupied by steam generated from the original pound of water would be 51.3 cubic feet, as in "D," in other words 1 pound of water evaporated into steam at 15 inches of vacuum will, as steam, fill approximately twice the space at 1 pound pressure. It is evident then, that as pressure increases volume of steam decreases, and as pressure decreases volume of steam increases.

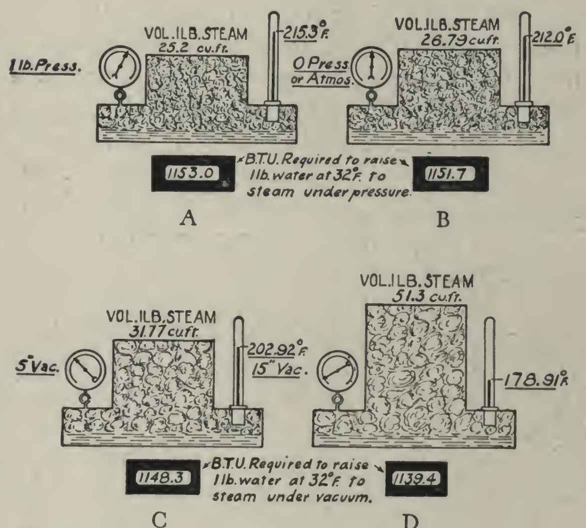

Fig. 3

In direct proportion, the amount of heat required to generate steam also varies with that of pressure, as indicated in Fig. 3. The amount of heat required to evaporate one pound of water under an induced pressure of one pound per square inch (see "A," Fig. 3) is much greater than the amount of heat required to evaporate the same pound of water in vessel "C," in which the pressure has been reduced to 5 inches of vacuum. This is due to the fact that in vessel "A" sufficient energy or heat must be absorbed by the water to overcome the pressure exerted upon the surface of the water which will tend to prevent the molecular expansion of water until the amount of energy is added to the water to equal that of the pressure upon the water. In vessel "C," there is less pressure to overcome, therefore a lesser amount of energy is to be added to the water to overcome the existing pressure. Expressed in B.t.u.* the energy expended to evaporate the water (the initial temperature of water assumed at 32° F.) in vessel "A" would be 1153 B.t.u., while the B.t.u. required to evaporate the water in vessel "C" would be 1148.3 B.t.u. The relation between pressure of steam and heat may be expressed: as pressure increases the amount of heat increases; as pressure is decreased, the amount of heat required decreases proportionately.

*The symbol B.t.u. is an abbreviation for British thermal unit. It is defined as the mean amount of heat required to raise the temperature of 1 pound of water 1° F., therefore to heat a pound of water from 32° F. to 40° F. will require 8 B.t.u.

From the above discussion, several axioms are brought to mind:

1. As pressure increases, volume of steam decreases.
2. As pressure decreases, volume of steam increases.
3. As pressure increases, heat required increases.
4. As pressure decreases, heat required decreases.
5. As heat increases, pressure increases.
6. As heat decreases, pressure decreases.

By summing the totals of these axioms, one may readily comprehend that to generate steam at pressures at or below atmosphere will require much less fuel than to generate steam above atmospheric pressure.

Flexibility

The Marsh Weather Compensating System of Heating employing this principle, in conjunction with the limiting effect of the Marsh Compensating Trap upon the individual radiator, has such flexible features that the volume and temperature of steam delivered to the radiators are directly proportioned to correspond with the heat demand required for prevailing weather conditions. Controlling the temperature of steam distributed to the system and automatically maintaining a required volume of low temperature steam in the radiators, tends to effect a fuel saving that has been tried and proven with astounding results.

In applying these same principles of the various properties of steam to the operation of the heating system it follows that any heating system having a certain internal cubical content will fill proportionately with the pressure carried on the system. To illustrate, say a pound of steam at 1 pound pressure gauge will fill a certain amount of radiation or volume of its cubical content. Then at atmospheric, or 0 pound gauge, the same pound of steam will fill a greater amount of radiation, and that in turn, steam at say 5 inches of vacuum, having assumed a still greater volume will fill a greater cubical content.

Effects of Variation

In the Marsh Weather Compensating System of Heating steam under varying pressures has three direct effects of variation due to changing pressures.

First, varying the pressure of steam varies the volume of this steam and the cubical content which a given amount of steam will fill.

Second, varying the temperature means a variation of the B.t.u. content of a given space filled with steam.

Third, as a direct action upon the Marsh Compensating Radiator Trap, it controls the amount of a given radiator which can consume steam or which is available for heating purposes.

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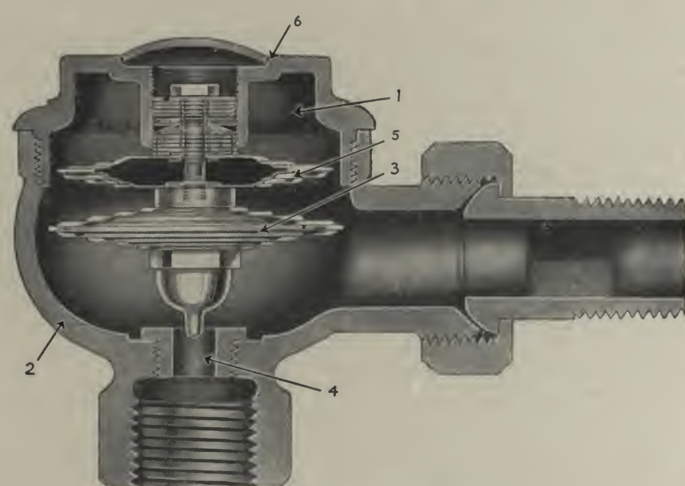
"Compensating"

The invention of the Marsh Compensating Radiator Trap has brought to the heating profession a new principle of operation—that of utilizing air which is ever present in all heating systems. Heretofore, the prime object in vacuum heating systems was to purge the system of air as quickly as possible, but the Marsh Compensating Radiator Trap makes use of a portion of the air present in the radiator.

not sufficient to entirely close the trap, and the upper diaphragm (5), operated by the difference in pressure between the vacuum existing on the outside of the diaphragm and atmospheric pressure existing within, expands, carrying the lower diaphragm and valve piece downward to the closed position.

The two diaphragms actuated by their respective forces are so related in their operation that under



Marsh Compensating Trap

In construction, the compensating radiator trap consists of a diaphragm assembly (1) inserted into a body (2). The diaphragm assembly incorporates two distinct types of diaphragms.

The lower diaphragm (3) is identical to that of the Marsh No. 1 Series Thermostatic Traps, that is, this diaphragm is filled with a volatile fluid as the motor element and responds to the heat of steam to open or close the outlet orifice of the trap.

The upper diaphragm (5) communicates with atmosphere through leakage in the top escutcheon (6) of the trap, and is so arranged that it operates independently of the lower diaphragm.

Under conditions of steam pressure ranging from 0 pound gauge upwards, the lower diaphragm (3) functions as in an ordinary Marsh Radiator Trap closing the valve against passage of steam at corresponding temperatures.

With steam in the radiator under vacuum conditions and at correspondingly lower temperatures, the heat in contact with the lower diaphragm (3) is

all conditions of vacuum at which the heating system operates they combine to close the trap against passage of steam at corresponding temperatures.

In the process of steam condensing and through natural infiltration, air and other non-condensed gases become entrained within the radiator and, being heavier than steam, tend to settle toward the bottom of the radiator and as the trap closes under the lower temperatures after passing off condensate, these gases are entrained within the radiator occupying a certain portion of the same with the corresponding exclusion of steam from such portions. (See Fig. 4, following pages.) With the system operating under vacuum, as the temperature at which the trap opens and closes varies with the vacuum in the radiator, the portion of the radiator filled with these gases varies as the portion of the radiator available for steam decresaes or increases.

This process, which is the foundation of this new Marsh System, has been designated as "Compensating."

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Application of These Principles to Various Weather Conditions

The five graphs comprising Fig. 4 illustrate the application of these principles of controlling the pressure, the volume and the temperature of steam and the percentage of a radiator available for heating in the Marsh Weather Compensating System and the relation of same to maintaining the temperature to which the building is to be heated, with five typical outside temperatures.

A—Zero Weather

By referring to Fig. No. 4, the Graph A shown will illustrate the application of these principles of controlling, the pressure, volume, temperature of steam and the percentage of a radiator available for heating and the relation of same to maintaining a constant temperature within a room at 70° F. with the outside temperature varying. Graph A indicates an outside temperature of 0° F. and a required inside temperature of 70° F. Assuming a radiator of 100 square feet in size and based upon raising the temperature with this radiator from 0° to 70° F. it is necessary to circulate steam throughout the system at 1 pound pressure. At this gauge pressure 1 pound of generated steam will assume a volume of 25.2 cubic feet and have a corresponding temperature of 215.3° F. Assuming the normal efficiency at this temperature of 99 per cent, this 100 square foot radiator will have a heat emission capacity of 23,763 B.t.u. per hour, which is a sufficient heat emission to maintain a constant temperature within the room of 70° with zero outside temperature.

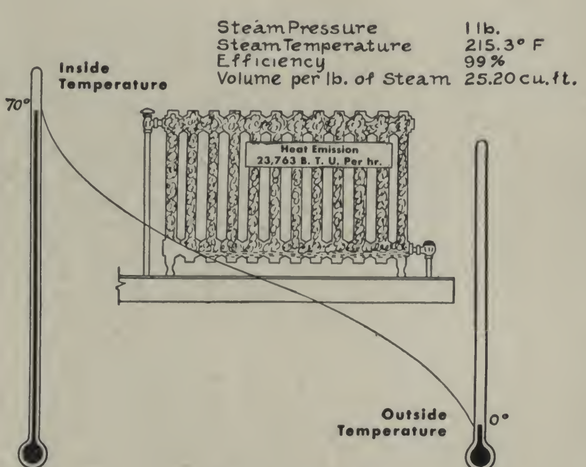

Fig. 4, Graph A

B—10° Above Zero

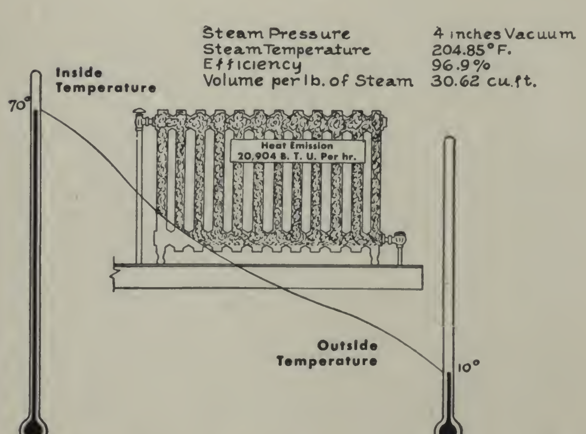

Fig. 4, Graph B

In Graph B we illustrate a condition of outside temperature at 10° F. above zero and the desire to maintain an inside temperature of 70° F. with the same radiator of 100 square feet. In the Marsh Weather Compensating System of Heating this result is arrived at by circulating steam throughout the system at a steam pressure of 4-inch vacuum gauge. At this pressure 1 pound of generated steam assumes a volume of 30.62 cubic feet with a corresponding temperature of 204.85° F. and due to the action of the steam under the sub-atmospheric pressure of 4 inches, the Marsh Compensating Trap has now functioned to reduce the efficiency of the radiator so that only 96.9 per cent of same is available for heat content or heat emission. Due to the greater volume of a pound of steam, and to the decrease in the amount of the radiator which is available for heating purposes, we now have a corresponding lower B.t.u. content in the radiator and as a result the heat emission capacity of the radiator has been reduced to 20,904 B.t.u. per hour.

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C—25° Above Zero

Assuming that the outside temperature has risen to a marked degree, say 25° F. above zero, the compensating action of the Marsh Compensating Radiator Trap is illustrated in Graph C. In order to maintain an inside temperature of 70° F. at the outside temperature given, the Marsh Weather Compensating System of Heating obtains this result by circulating steam throughout the system at a pressure of 10 inches vacuum. Steam generated under 10 inches vacuum will have a corresponding volume of 39.16 cubic feet per pound of steam, having a relative temperature of 192.19° F. The Marsh Compensating Radiator Trap under these conditions will automatically compensate the radiator so that only 85 per cent of the entire radiator is available for heating purposes, the remaining 15 per cent being rendered inefficient due to the action of the trap. Still assuming the radiator to be 100 square feet, and with 15 per cent of this radiator not available for heating purposes, the total heat emission for the entire radiator will be 16,515 B.t.u. per hour. This heat emission is equivalent to heat loss of the room under existing outside temperatures.

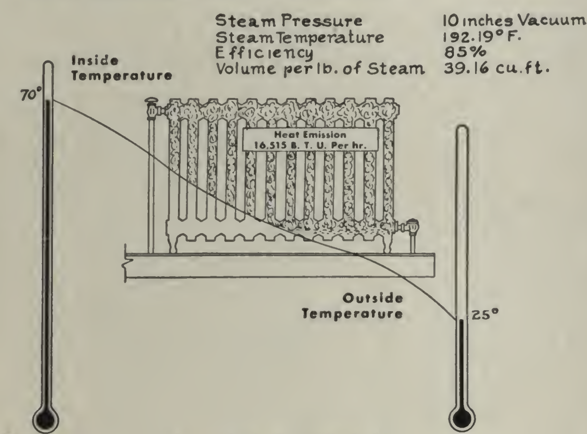

Fig. 4, Graph C

D—40° Above Zero

The same principles as explained above still apply should the outside temperature register 40° above zero (Graph D) and it will be noted that there is a marked degree of inefficiency of the radiator at this outside temperature. Under the given conditions, steam is circulated at 12-inch vacuum to the entire system. Steam at 12-inch vacuum will have a temperature of 187.21° and the volume of 1 pound of steam will be equivalent to 42.27 cubic feet.

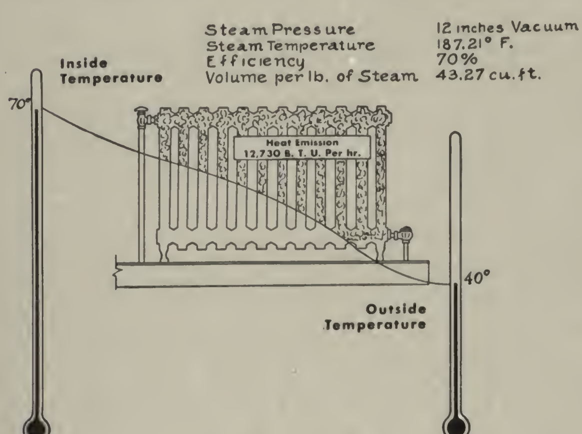

Fig. 4, Graph D

The Marsh Compensating Radiator Trap under these conditions will automatically compensate the radiator so that now only 70 per cent of the entire radiator is available for heating purposes, the remaining 30 per cent being rendered inefficient due to the action of the trap. Still assuming the radiator to be 100 square feet in size and with 30 per cent of this radiator not available for heating purposes the total heat emission for the entire radiator will be 12,730 B.t.u. per hour. This heat emission is equivalent to the heat loss of the room under existing outside temperatures.

E—55° Above Zero

When outside temperatures resemble that of a mild spring or fall day, say 55° above zero, it is evident that very little heat loss occurs, and therefore the heat output of a radiator must be correspondingly reduced. When such a condition occurs, the steam as supplied to a Marsh Weather Compensating System of Heating is at a pressure of 15 inches of vacuum, having a volume of 51.3 cubic feet per pound of steam and a temperature of 178.91° F. The Marsh Compensating Radiator Trap under these conditions will automatically compensate the radiator so that now only 50 per cent of the entire radiator is available for heating purposes, the remaining 50 per cent being rendered inefficient due to the action of the trap. Still assuming the radiator to be 100 square feet in size and with 50 per cent of this radiator not available for heating purposes the total heat emission for the entire radiator will be 8,440 B.t.u. per hour. This heat emission is equivalent to the heat loss of the room.

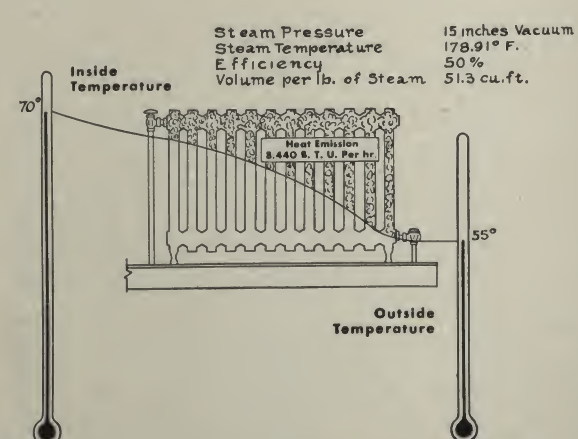

Fig. 4, Graph E

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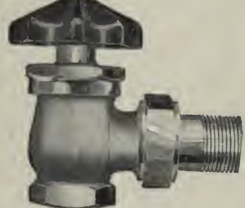
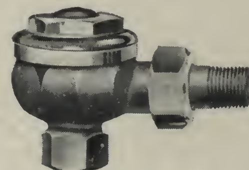
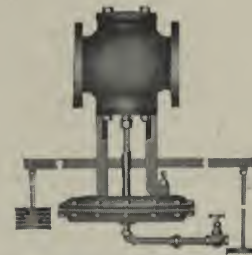
Typical Installation Marsh Weather Compensating System of Heating

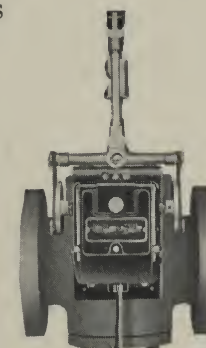
Showing Customary Arrangement of Marsh System Units

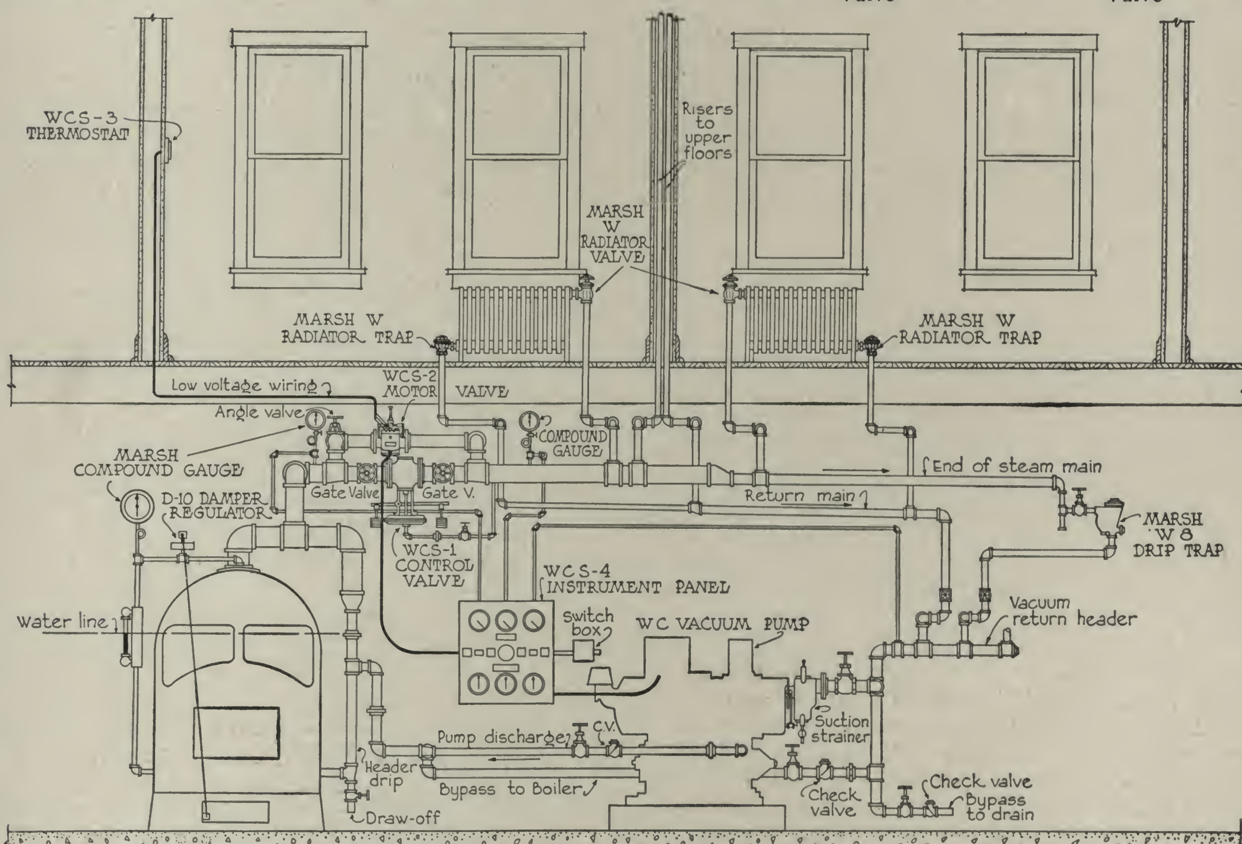

Type W Radiator Valve

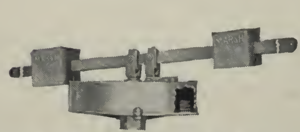

Type W Radiator Trap

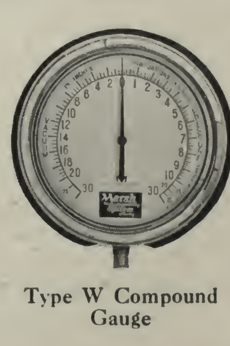

Type W Thermostat


Type W Supply Control Valve


Type W Motorized Valve




Type W Damper Regulator


Type W Compound Gauge


Type W Control Panel


Type No. W-8 Drip Trap

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Description of Operation of the Marsh Weather Compensating System of Heating

The Marsh Weather Compensating System of Heating is a two pipe vacuum system operating at pressures ranging from above atmosphere to sub-atmospheric pressures as low as 15 inches of vacuum, which are varied according to prevailing weather conditions. It utilizes equipment which makes it possible to generate and circulate steam under vacuum, which, coupled with the operation of the Marsh Compensating Radiator Trap, gives perfect modulation of the radiator under all operating conditions.

Marsh Weather Compensating System of Heating

The piping for a Marsh Weather Compensating System is practically the same as for an ordinary vacuum system. A series of steam and return piping is utilized to transmit steam to and return condensation and air from the radiating units. Standard trade practices as to pipe sizes, boilers, radiation and other appurtenances are followed. Steam may be supplied from a boiler plant integral with the building or from outside sources.

The system is applicable to all types of modern radiating units and may be used in conjunction with unit heaters, ventilating systems, and air conditioning apparatus.

The installation of the Compensating Radiator Valve and Trap completes the radiating unit.

The steam supply system is fitted with one or a series of compensating control valves, the type and number of which depend upon the type of building to which the system is applied. These valves control the flow and pressure of the steam into the supply system and the radiation.

The return line system follows back to a vacuum pump which is employed to create circulation and to withdraw the water of condensation from the system and return it to the boiler plant. This pump also functions to withdraw from the system such air and gases which are not utilized in the Compensating Process.

Control panels are equipped with indicating, recording and controlling instruments. Incorporated in the make-up of the control panel is the Marsh Compensating Governor which regulates the operation of the vacuum pump,

In addition to this the panel also contains switches for the operation of the various electrical units.

Zoned Type Marsh Weather Compensating Systems of Heating

Zoning, as applied to a heating system, means that the system is divided into individual circuits or zones, each zone supplying the required amount of heat to meet the demands of that particular zone, operated as a separate system in itself. This means that the correct amount of heat can be supplied to meet the conditions of outside weather to which any portion of the building is subjected. Buildings often have one side exposed to a prevailing wind, in which case, the side of the building facing this direction requires more heat than the opposite side. To meet this condition the zone supplying heat to that particular side of the building operates at a slightly higher pressure than in the other sides of the building, supplying an amount of heat to balance heat loss caused by the wind.

Sun rays likewise have a direct effect upon heating systems. A portion of a building favored by sun rays will require less heat from the system, while the shaded side of the building will require more. Where this holds true, the portion of the building favored by sun rays is operated at a lesser pressure than the shaded portions, taking advantage of the sun heat and preventing overheating.

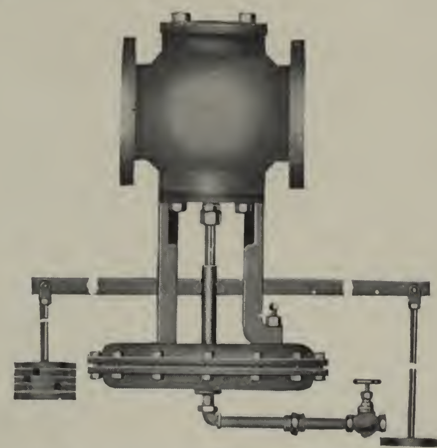
Continued on next page

Marsh Manually Controlled Weather Compensating System of Heating

On this type of system the operating engineer so manipulates the lever weights on the supply control as to obtain the desired pressure or vacuum. On coal fired boilers the pressure within the boiler is regulated by a sensitive damper regulator and where oil or gas is used devices are included with the equipment which can be regulated so as to carry the required pressure or vacuum. As an example assuming that the outside temperature is equivalent to that of a mild spring or fall day the operating engineer adjusts the weights on the supply control to pass only sufficient steam so as to maintain the desired vacuum in the house side of the supply system.

At this depth of vacuum the volume of steam circulated will be sufficient to care for existing heat demands eliminating overheating in the building, with the resultant fuel saving.

When the weather becomes colder the weights are adjusted so that the amount of steam and the vacuum in the supply system is regulated accordingly. In severe weather the weights are adjusted so pressures above atmosphere are carried in the supply system, depending upon the severity of the weather conditions.



Type W Diaphragm Supply Control Valve

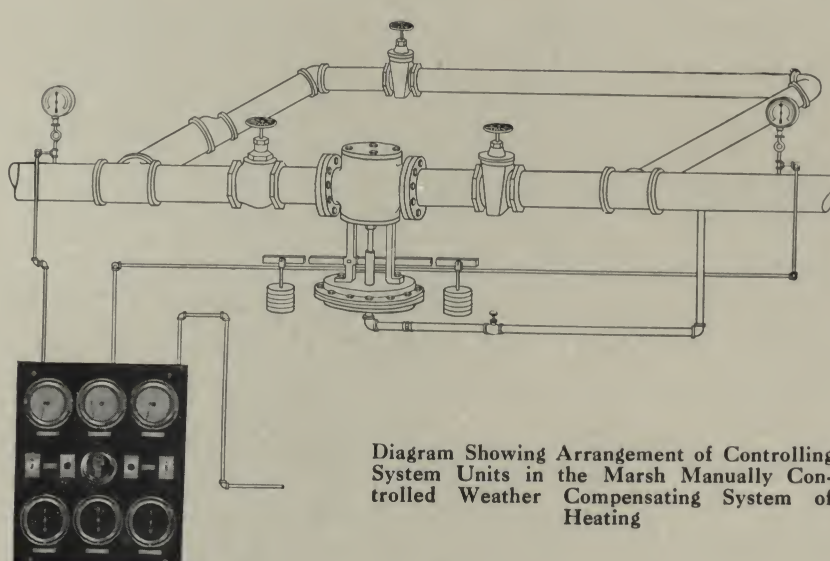


Diagram Showing Arrangement of Controlling System Units in the Marsh Manually Controlled Weather Compensating System of Heating

Marsh Semi-Automatic Weather Compensating System of Heating

This type of Marsh Weather Compensating System of Heating includes a control consisting of a Compensating sub-atmospheric supply valve and motorized by-pass valve operated by a thermostat.

The sub-atmospheric supply valve is located in the supply main proper with a three valve by-pass in which is located the motorized valve, which in turn is actuated by a thermostat located in a key position.

Continued on next page

The Compensating supply valve is so adjusted that the pressure or vacuum of steam necessary to obtain circulation at the desired temperature corresponds to that of 15 degrees above the average temperature as reported by the U. S. Weather Bureau in each particular locality. To illustrate assume a locality with an average yearly temperature of 35 degrees above zero, the adjustment on the Compensating sub-atmospheric control valve is set to the equivalent of 50 degrees.

Under these conditions the Compensating sub-atmospheric supply valve would supply sufficient steam to the system to maintain the desired inside temperature.

However, when the outside temperature drops in turn, affecting the demand for heat within the building, the thermostat will act, causing the Compensating motorized by-pass valve to open to supply the additional steam necessary.

Where desired, manual switches are provided on the control panel so that the automatic control may be opened entirely for quick heating up periods.

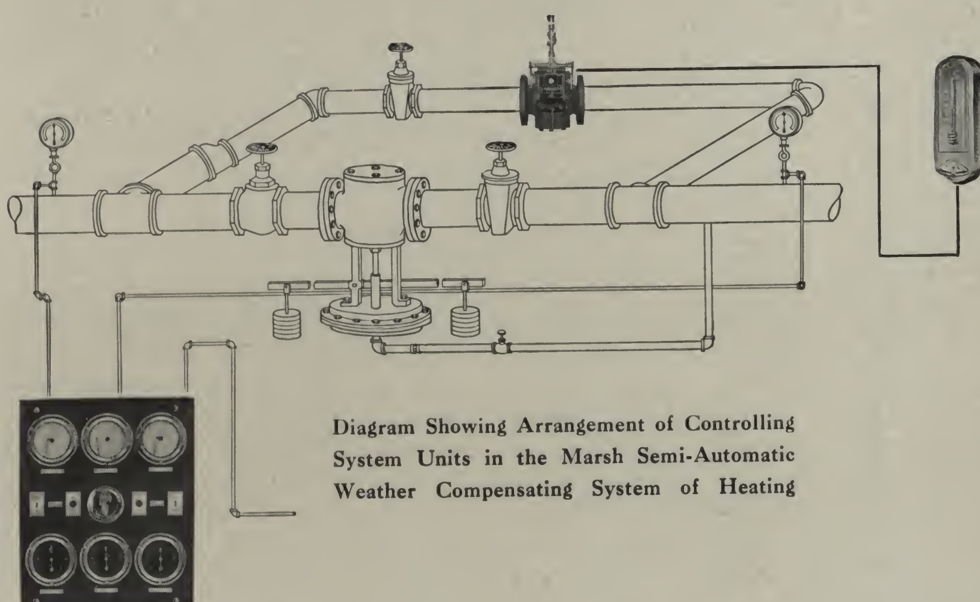


Diagram Showing Arrangement of Controlling System Units in the Marsh Semi-Automatic Weather Compensating System of Heating

In this type of system the number of adjustments required are few for the average heating season. The extent of the adjustments is to remove or add a small weight to lever arm of compensating supply valve.

Marsh Automatic Weather Compensating System of Heating

Where entirely automatic operation is desired the Automatic Weather Compensating System of Heating is supplied.

In this system supply control consists of a Compensating supply valve entirely actuated by a series of thermostats and motors.

A series of outside thermostats each operating within a given range controls the Compensating supply valve to allow the proper amount of steam for each range of temperature to enter the system. An inside thermostat acts as a master to control the action of the outside thermostats.

Where desired, manual switches are provided on the control panel so that the compensating supply valve may be fully opened for quick heating up periods.

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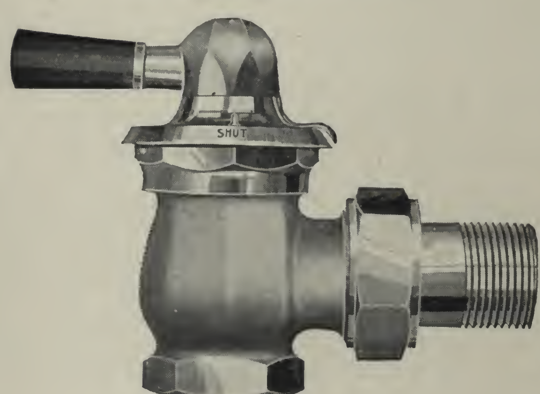
Marsh
Weather Compensating
System Units

The following pages are devoted to a description of the necessary System Units and their application to the various types of Marsh Weather Compensating Systems of Heating. Realizing that any system of heating is no better than the units of which enter into the building of it, Jas. P. Marsh & Company has utilized its many years of experience to develop the necessary perfection of these units to assure an unfailing and accurate delivery of heat.

The Marsh Weather Compensating System Units described in the following pages are most modern in design and in principle of operation. Beauty is featured in these units where beauty is essential, yet efficiency in operation and sturdiness in design has been the prime object in the production of the system units comprising the various types of Marsh Weather Compensating Systems of Heating. The controlling system units described have been designed to meet the demands of modern methods of heating, providing ease and simplicity in operation and permitting the system to be operated flexibly to provide the correct amount of heat as prevailing weather conditions demand.



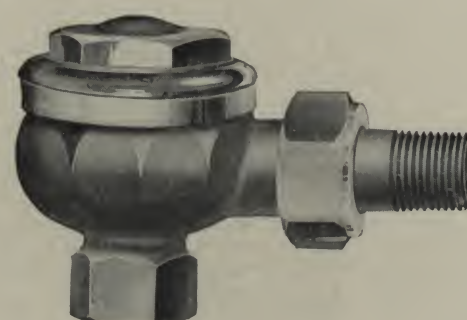
Type W Radiator Valve

The purpose of the Type W Radiator Valve is to allow the room occupant to either prevent the admission of steam altogether or allow the steam to enter in amounts that are taken care of, according to the weather, by the operation of the weather compensating system.

The octagonal body lines of the Type W Radiator Valve blend perfectly with the body lines found in the modern tubular radiator, and as installed in combination with the Type W Radiator Trap, has a pleasing effect. The Type W Radiator Valve stands out in pleasing relief in a two-tone chrome finish; the body in satin chrome and the bonnet and tailpiece in polished chrome. A handle crowns the Type W Radiator Valve, lending itself to easy opening or closing of the valve.

The interior construction of this valve is unique, utilizing two monel metal discs and two stainless steel discs as the packless feature, which makes possible the elimination of the conventional spring, composition packing glands, bellows or multiple diaphragms found in most radiator valves today.

Data on valve extensions and other accessories are given in bulletin No. 150.



Type W Radiator Trap

One of the most important system units incorporated into all types of Marsh Weather Compensating Systems of Heating is the Type W Compensating Radiator Trap. Upon it falls the duty of constantly restricting the heat output of the radiator so that regardless of outside weather conditions the heat output of the radiator will balance that of heat demand. The compensating effect of the Type W Compensating Radiator Trap has been acknowledged as an outstanding development in heating systems.

A careful study of the octagonal body lines of the Type W Compensating Radiator Trap will show a pronounced similarity to the body lines of the modern tubular radiator; likewise, its contour resembles that of the Type W Radiator Valve. As installed on the radiator in combination with the Type W Radiator Valve, it not only performs its compensating action but also tends to beautify the radiator, which as a whole blends with modern interior decorations.

The Type W Compensating Radiator Trap is finished in two-tone chrome; the body in a satin finish chrome and the bonnet and tailpiece in polished chrome.

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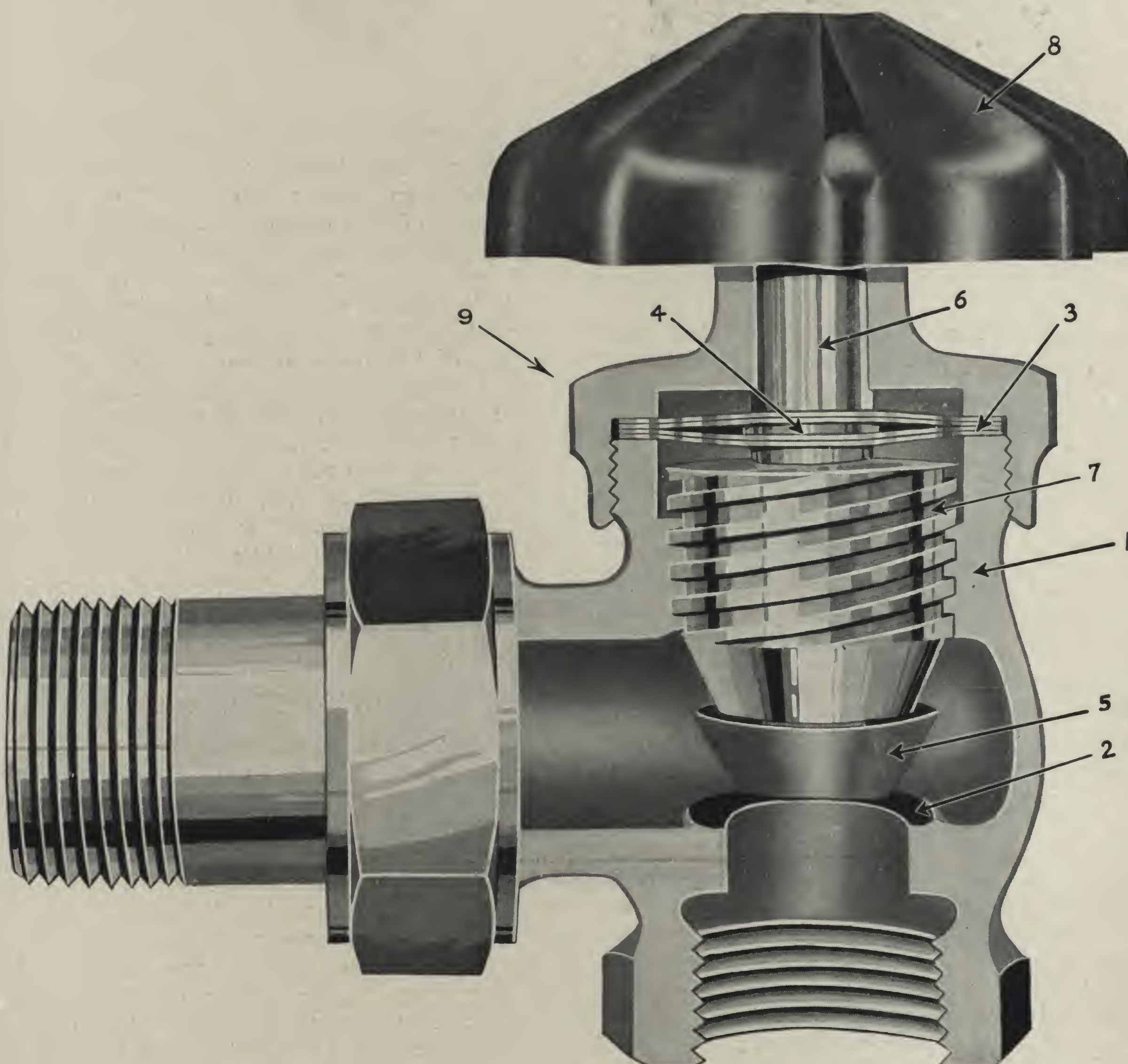
View Showing Interior and Construction of the Marsh System Unit Packless Radiator Valve



1—Valve Body
2—Valve Seat
3—Metalflex Sealing Discs
4—Stem Collar
5—Flexcone Valve Disc
6—Valve Stem
7—Thrust Screw
8—Bakelite Handle
9—Valve Bonnet

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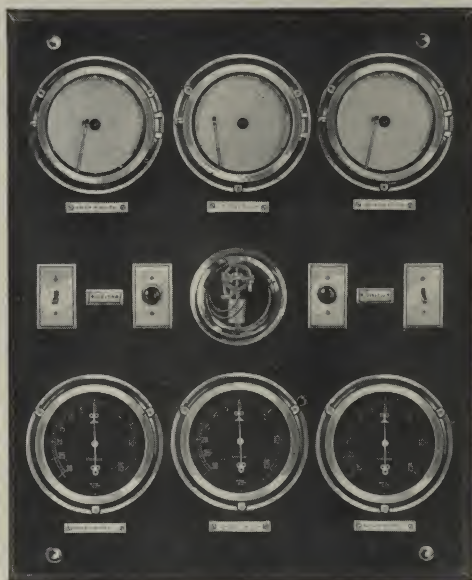

Compensating Control Panel

Control panels for use on Marsh Weather Compensating Systems of Heating are designed to met the requirements of individual installations, primarily intended to indicate to the operator of the system the conditions under which the system is operating at the time of observation, likewise serving as the controlling unit to maintain the required differential between supply and return systems.

Marsh Recording Gauges are employed to provide the operating engineer with a permanent record of the pressures carried on the initial steam supply line, the house supply line and the depth of vacuum carried on the return system. For observation purposes, Marsh Indicating Gauges are included on the control panel to correspond to the recording gauges, permitting the operator to determine at a glance the conditions existing in the supply and return systems.

As the control unit, each control panel is equipped with a Marsh Weather Compensating Governor together with a Marsh Mercury-to-Mercury Switch. The governor is self-adjusted, and equipped with lock box and key to prevent unauthorized persons to tamper with adjustment. Knock-out boxes are provided for conduit to street service and for conduit from mercury switch to vacuum pump. Bulls-eye lights and snap switches are included to indicate to the operator the "on" and "off" positions of vacuum pump. All connections to gauges and governor are piped up with copper tubing, requiring a minimum of piping to be installed on the job.

Where desired manual switches are provided on the control panel so that the automatic supply control may be opened entirely for quick heating up periods.

Type WC Thermostats

Marsh Semi-Automatic and Full Automatic Weather Compensating Systems of Heating utilize the Type WC Thermostat as the temperature regulating medium, and by automatically maintaining the required temperature contribute to the conservation of fuel. The actuating means of the thermostat is a bimetallic strip of such sensitivity that a temperature change of 1 degree causes operation of motor included in its circuit. Equipped with an indicating spirit thermometer to show operating engineer the existing temperature condition in the building. Key adjustment enables the required temperature to be set at any point between 50° F. and 90° F., the key adjusting feature preventing unauthorized parties changing the indicator setting.

On semi-automatic systems, one thermostat is required for each circuit or zone of supply piping, specified as:

WCS-3 *Thermostat*

The thermostat on the semi-automatic system is located at a point where the mean conditions exist, termed as the "key position."

On the full automatic system, a thermostat identical to that used on the semi-automatic system is located at a key position and is designated as the WCA-3A Thermostat. In addition to the inside thermostat, the full automatic system employs a system of thermostats located on the outside of the building, comprising several thermostats having various temperature settings to correspond to weather conditions in that locality. The entire group of thermostats are protected by a marine box, permanently set and locked in the box to prevent tampering with adjustments.

This group of thermostats with marine box is specified as:

WCA-3 *Multiple Thermostat Box*

Type WC Thermostats are arranged for stand- and three-wire low voltage wiring.

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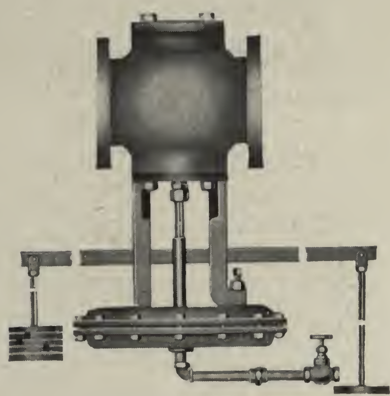
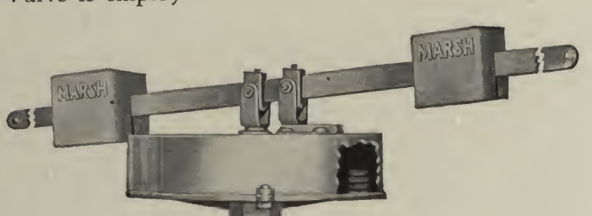


Type WC Diaphragm Supply Control Valve

A sub-atmospheric control valve employed on most types of Weather Compensating Systems of Heating. In general, the valve body and diaphragm chamber is of cast iron with standard drilled flanged ends. Extra large valve port is obtained by a double valve arrangement, having bronze seats and guides rigidly attached to the diaphragm by a brass post. Diaphragm is of a special composition rubber of very large proportions, which makes possible a close regulation of pressures. As a protection against over-pressure in the supply side of the system, an equalizing connection is provided in the base of the diaphragm chamber. This equalizing pipe should be installed in the *bottom* of the supply pipe on the reduced side of the system, and it is equally important that the equalizing pipe be filled with water at least 3 inches above top of the diaphragm chamber before being put in operation to prevent steam coming in contact with the diaphragm.

The adjustment of this valve is obtained by an arrangement of fulcrum arms and weights, which in turn actuate the double valves. A correct adjustment for a given pressure may be obtained by the removal or addition of the weights supplied with this valve. Type WC Diaphragm Control Valves furnished in sizes 2 to 18 inches, standard flanged ends, complete with companion flanges and bolts, faced and drilled.

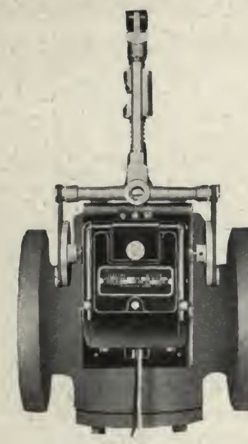
On Manual Control Weather Compensating Systems of Heating the WCM-1 Diaphragm Control Valve is employed.



Boiler Damper Regulator

This device functions to control the dampers on hand fired coal boilers. A lever arm is automatically actuated to control the dampers.

In stoker, oil or gas fired boilers Marsh Merkustat Regulators are provided.

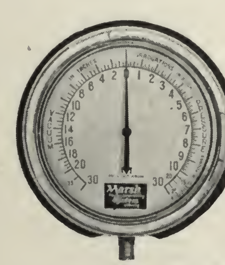


Type WC Motor Valve

The valve proper is a balanced valve having a sturdy motor mounted thereon to open or close the valve according to the action of the thermostat. Motor is arranged to operate on 110 volt, 60 cycle alternating current, having an automatic feature of reducing the current to low voltage for the thermostat circuit, eliminating a transformer to reduce the current to low voltage. An arrangement of gears, eccentric cams and levers allows a complete opening or closing of the valve in 30 seconds. Valve proper has cast iron body, double bronze seat and guides, and other trimmings of bronze.

On full automatic weather compensating systems of heating, the WCA-2 Motor Valve is used. The valve proper is a WC-1 Control Valve equipped with sensitive diaphragm, lever and weights, illustrated in this section. The same type WC Motor is used on this valve as is used on the WCS-2 Motor Valve, designed to actuate according to variations in temperature recorded by thermostats located in the WCA-3 Multiple Thermostat Box.

Both Type WCS-2 and Type WCA-2 Motor Valves can be furnished in sizes from 2 to 18 inches, flanged ends complete with companion flanges and bolts, faced and drilled.



Type W Indicating Gauge

This instrument is provided as a regular part of all Marsh Weather Compensating Systems for installation on the house side of supply and return systems, also for installation on boilers. Pressure is graduated to 10 pounds in magnified reading and retarded to 30 pounds. Vacuum is graduated to 20 inches in magnified readings and retarded to 30 inches.

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Marsh Type W Drip Traps

Marsh No. W-8 Drip Trap

This trap is continuous in discharge and is designed to quickly remove condensation and air from drip points on steam mains, steam risers, steam coils, or blast heaters, or for any like service within the capacity of the trap.

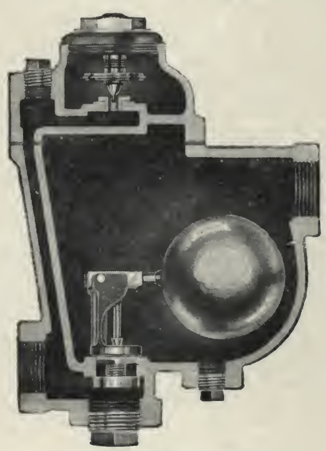
The design permits a deep water seal on the discharge valve. This water discharge valve is float controlled and located at a low point in the bottom of the trap and air is removed through a thermostatically controlled port in the cap of the trap. The by-pass member used is the standard assembly as in the No. W-1 compensating radiator trap. Normally air is discharged through a port directly to the outlet connections of the trap. In cases where the trap may be required to discharge to a wet return the air discharge may be connected to a dry return from a special opening tapped in the cap of the trap.

Body of trap is provided with one 1¼-inch tapped inlet and two 1¼-inch tapped outlet openings. These openings are located so as to permit direct connection both to inlet and from outlets.

The trap may be suspended directly in the piping and no other supports are necessary. The compensating element screws directly in the cap of the trap and is interchangeable with the element from our No. W-1 compensating radiator trap.

All interior parts are of forged bronze castings with the exception of the float which is a seamless copper float tested for a working pressure of 25 pounds per square inch.

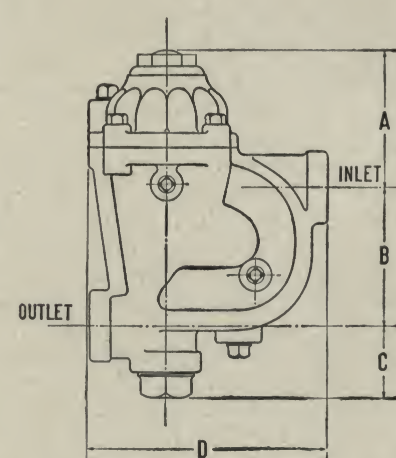
Copper asbestos gaskets are used throughout which avoid the necessity of supplying new gaskets whenever trap may be opened for inspection or repair.



No. W-8 Drip Trap

CONNECTION SIZES
1¼-in. Inlet
1¼-in. Outlet

DIMENSIONS
A—4⅜ in.
B—4⅛ in.
C—2¼ in.
D—7 11/16 in.



Marsh No. W-12 Drip Trap

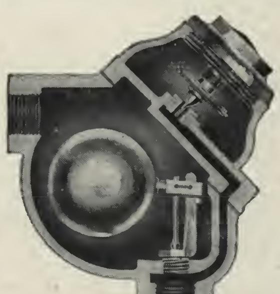
Designed for removal or air and condensation from short steam mains, branches or riser. Unit heaters, steam coils, etc., are within the limits of the capacity of the trap.

The size and weight of the trap permits its installation in the piping without any other means of support.

Condensation is removed through a float operated valve located at the lowest point inside the trap body. Air removal is located in the cap of the trap. Air passes through a passageway and out through the trap outlet.

Body of trap is of cast iron and all interior parts are of forged steam bronze, copper and monel metal.

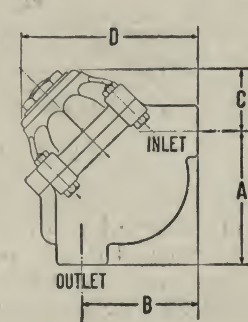
The by-pass member is interchangeable with the member of the standard No. W-1 compensating radiator trap.



No. W-12 Drip Trap

CONNECTION SIZES
¾-in. Inlet
¾-in. Outlet

DIMENSIONS
A—4½ in.
B—3⅞ in.
C—1⅞ in.
D—6 in.



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Marsh Type W Heavy Duty Traps

Marsh No. W-9 Heavy Duty Trap

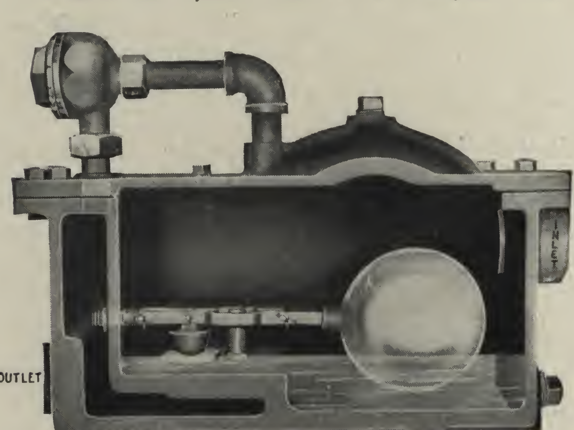
The Marsh No. W-9 Heavy Duty Trap has a wide field in which it may be applied to equipment using steam as a heating element. This trap was designed especially for services where very large volumes of water and air must be taken care of as rapidly as possible, adding greatly to the efficient operation of the equipment upon which it is applied during the initial starting-up period.

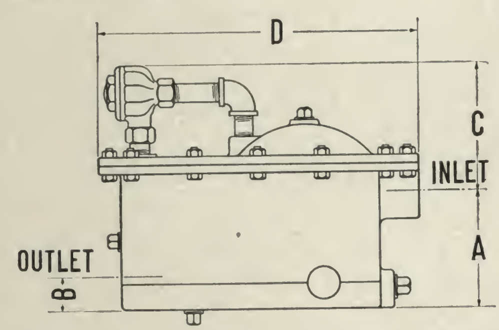
The Marsh No. W-9 Heavy Duty Trap may be applied to any service requiring this type of trap, where the discharge of the trap is connected directly into the vacuum return line, such as main risers, bleeder lines, large unit heaters and occasionally, vento. In the case of vento heaters and hot water storage heaters, steam is usually supplied by individual supply lines directly from the source of supply at pressures ranging from 1 to 10 pounds. Such equipment must be treated differently in so far as return lines are concerned.

Usually, the returns from these units are handled through standard heavy duty traps directly into a condensation pump instead of discharging into a vacuum return line, primarily because hot condensate discharged into the vacuum return line will cause the condensate to flash back into steam. Where such an arrangement is incorporated into a Marsh Weather Compensating System of Heating, a standard Marsh No. 9 Heavy Duty Trap is used.

Where the system can be so designed that vento heaters are supplied with steam ranging from 2 pounds to sub-atmospheric pressures, the condensate can be discharged into the vacuum return line in the same manner as condensate from the direct radiation. In such cases, the Marsh No. W-9 Heavy Duty Trap is utilized having a No. W-1 Compensating Trap incorporated into the air by-pass.

In construction the Marsh No. W-9 Heavy Duty Trap is built to not only handle large volumes of water and air but is also designed to withstand heavy duty service. The body proper is of heavy cast iron, equipped with a removable cover. Extra proportions of metal are placed at the inlet and outlet stress points and it is also equipped with a plugged connection for draining. The entire float mechanism is of non-corrosive metals and so arranged to permit through passage of water. The ball float is of large proportions of heavy copper, designed to withstand pressures up to 25 pounds. The valve and valve seats are so arranged that at all times they are water sealed and likewise prevent accumulation of dirt interfering with a tight seat. As an integral part of the cover the Marsh No. W-1 Compensating Trap is incorporated as a means of eliminating accumulated air. This unit is rigidly attached to the cover permitting the entire cover and Compensating trap to be taken off should it be necessary to remove the cover for cleaning.





Spec. Symbol	Size	A	B	C	D
W-9-C W-9-D	1 " 1¼"	5½"	1½"	5 15/16"	14½"
W-9-E W-9-F	1½" 2 "	5⅝"	1¾"	6½"	16¼"

Marsh Compensating Return Line Regulating Equipment

This equipment permits vento heaters, hot water storage heaters, etc., which are operated at higher pressures, to be connected directly into the return line of a Weather Compensating System without the installation of a condensation pump.

The equipment consists of a standard No. 9 Series Heavy Duty Trap, a float and valve accumulator tank and a vacuum regulator, the latter installed in a by-pass around the accumulator. One set is installed for each group of pressure heating units.

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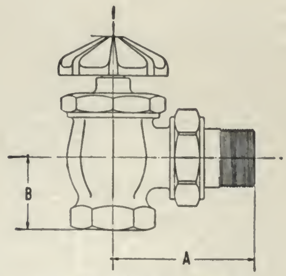
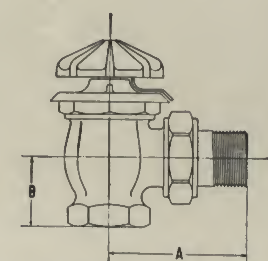
Patterns and Roughing-in Dimensions of Marsh Type W Radiator Valves



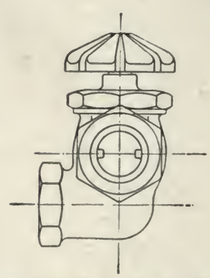
No. W-100-A (Angle)

DIMENSIONS IN INCHES

Sizes	A	B
½″	2⅜″	1 3/16″
¾″	2⅞″	1 3/16″
1 ″	3⅛″	1 9/16″
1¼″	3⅝″	1¾″
1½″	3⅞″	1½″
2 ″	4⅜″	2⅜″



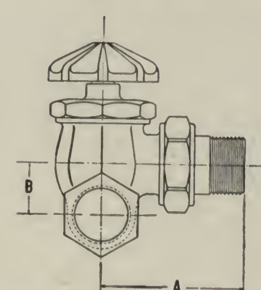
No. W-101-A (Wheel Angle—Graduated)



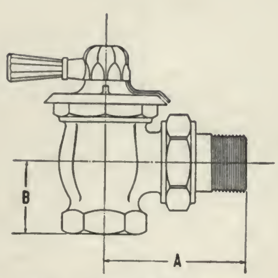
No. W-100-L (Left Hand Corner)

DIMENSIONS IN INCHES

Sizes	A	B
½″	2⅜″	¾″
¾″	2⅞″	27/32″
1 ″	3⅛″	⅞″
1¼″	3⅝″	1⅛″
1½″	3⅞″	1¼″
2 ″	4⅜″	1½″



No. W-100-R (Right Hand Corner)



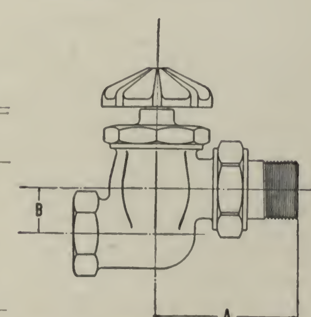
No. W-102-A (Lever Handle)

DIMENSIONS IN INCHES

Sizes	A	B
½″	2⅜″	1 3/16″
¾″	2⅞″	1 3/16″
1 ″	3⅛″	1 9/16″
1¼″	3⅝″	1¾″
1½″	3⅞″	1½″
2 ″	4⅜″	2⅜″

DIMENSIONS IN INCHES

Sizes	A	B
½″	1⅜″	2⅜″
¾″	1⅜″	2⅞″
1 ″	1 11/16″	3⅛″
1¼″	2 ″	3⅝″
1½″	2⅜″	3⅞″
2 ″	3 1/16″	4⅜″



No. W-100-B (Back Offset)

Explanation of Dimensional Tables

Type No. W-101 (Wheel Handle) and Type No. W-102 (Lever Handle) Graduated Valves as made in left hand corner pattern, right hand corner pattern and back offset pattern have the same roughing-in dimensions shown above for the Type W-100 Valves in these patterns. Roughing-in dimensions for Type Nos. W-103 Lock and Shield Packless Valves and W-104 Lock and Shield Graduated Valves in all patterns are the same as Type No. W-100.

TYPES AND PATTERNS OF MARSH SYSTEM UNIT RADIATOR VALVES

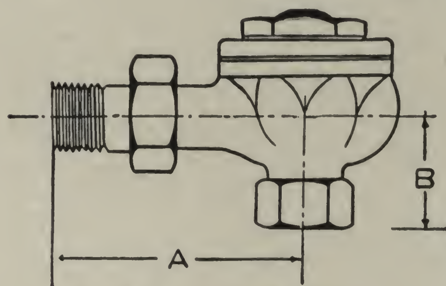
Type	Pattern	Symbol
Wheel Handle	Angle	W-100-A
Wheel Handle	Left Hand Corner	W-100-L
Wheel Handle	Right Hand Corner	W-100-R
Wheel Handle	Back Offset	W-100-B
Wheel Handle Graduated	Angle	W-101-A
Wheel Handle Graduated	Left Hand Corner	W-101-L
Wheel Handle Graduated	Right Hand Corner	W-101-R
Wheel Handle Graduated	Back Offset	W-101-B

Type	Pattern	Symbol
Lever Handle Graduated	Angle	W-102-A
Lever Handle Graduated	Left Hand Corner	W-102-L
Lever Handle Graduated	Right Hand Corner	W-102-R
Lever Handle Graduated	Back Offset	W-102-B
Lock and Shield	Angle	W-103-A
Lock and Shield	Left Hand Corner	W-103-L
Lock and Shield	Right Hand Corner	W-103-R
Lock and Shield	Back Offset	W-103-B

Note: Lock and shield construction can also be supplied in the graduated type valve—specified as No. W-104—in any pattern listed above.

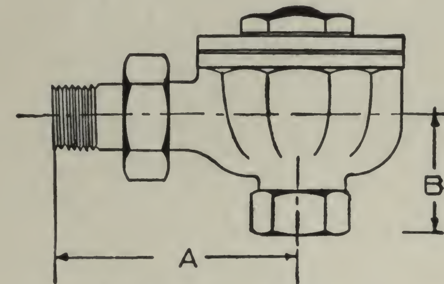
Continued on next page

Patterns and Roughing-in Dimensions of Marsh Type W Radiator Traps



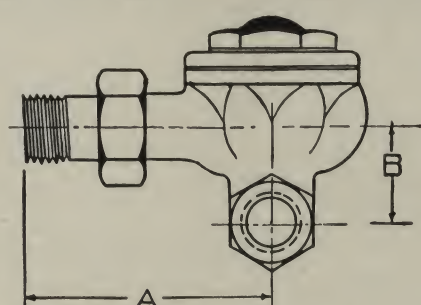
No. W-1-A (Angle Pattern)

Size	Capacity	A	B
½″	150 sq. ft.	3¼″	1½″



No. W-2-A (Angle Pattern)

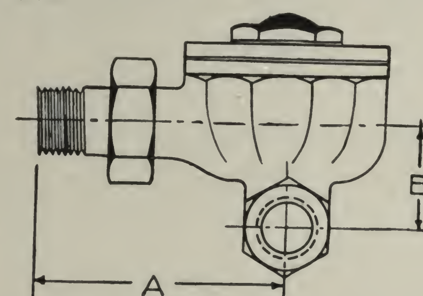
Size	Capacity	A	B
½″	200 sq. ft.	3½″	1⅞″



No. W-1-R (Right Hand) and No. W-1-L (Left Hand Corner Pattern)

Size	Capacity	A	B
½″	150 sq. ft.	3¼″	1¼″

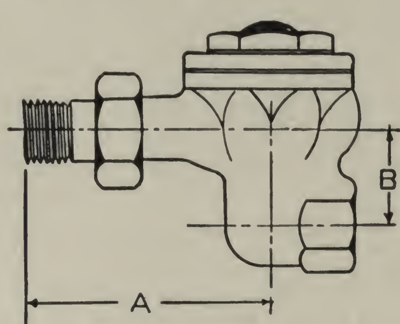
Dimensions on right and left hand patterns are identical.



No. W-2-R (Right Hand) and No. W-2-L (Left Hand Corner Pattern)

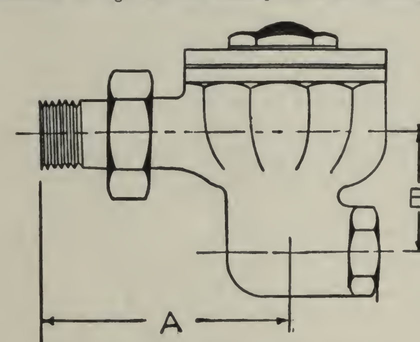
Size	Capacity	A	B
½″	200 sq. ft.	3¾″	1¼″

Dimensions on right and left hand patterns are identical.



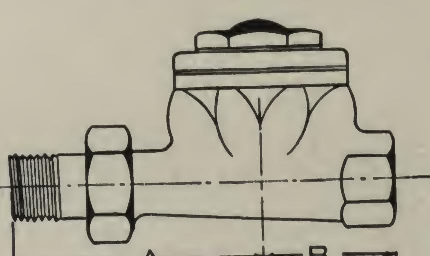
No. W-1-B (Back Offset Pattern)

Size	Capacity	A	B	C
½″	150 sq. ft.	3¼″	1¼″	1⅛″



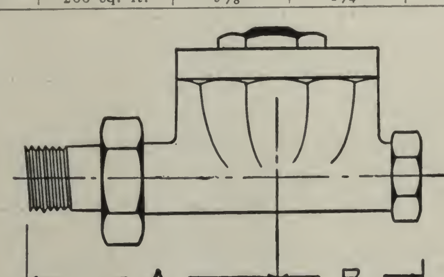
No. W-2-B (Back Offset Pattern)

Size	Capacity	A	B	C
½″	200 sq. ft.	3⅞″	1¼″	1⅜″



No. W-1-S (Straightway Pattern)

Size	Capacity	A	B
½″	150 sq. ft.	3¼″	1¾″



No. W-2-S (Straightway Pattern)

Size	Capacity	A	B
½″	200 sq. ft.	3¾″	2″

Continued on next page

Typical Specification for Marsh Weather Compensating System of Heating

1. General Conditions—The general conditions governing this portion of the work shall be in accordance with those of the American Institute of Architects and installation shall be in accordance with standard practices of the local association of contractors.

2. Scope of Work—The work to be done includes the furnishing of all labor and materials for the complete installation of a Marsh Weather Compensating System of Heating as hereinafter specified and as shown on drawings. Work to be done shall be executed in a neat and workmanlike manner, and all apparatus pertaining to this portion of the work to be of the best grade materials and shall strictly conform to these specifications.

3. Boiler—Boiler shall be a .... with guaranteed rating for .... sq. ft. of radiation and shall contain .... sq. ft. of heating surface. Boiler shall be installed upon suitable foundation and equipped with all connections and trimmings. For automatic stoker, oil or gas-fired boilers provision shall be made for connection of this apparatus to boiler in accordance with manufacturer's instructions.

4. Smoke Pipe—Connect boiler to chimney with suitable smoke pipe of .... gauge black steel, of size as recommended by boiler manufacturer.

5. Pipe and Fittings—Contractor shall furnish and install where indicated on plans all pipe and fittings properly supported and graded to insure a complete and successful operation of the system. Joints to be made up with a paste consisting of Portland cement and boiled linseed oil applied to male threads only. Provision to be made for expansion in all mains, risers and branches.

Boiler header shall be made up of standard flanged fittings connected to boiler full size of steam opening, same to be dripped to return header through a bleeder. All spring pieces to mains shall be taken out of top of mains at 45 deg. on upfeed systems and out of bottom of steam mains at 90 deg. on downfeed systems.

Supply mains shall be graded to ½ in. in 10 ft. away from boiler and dripped through Type W Drip Traps. Runouts or branches to radiators or risers to be graded not less than 1 in. in 10 ft. towards supply mains.

Return mains shall be graded 1 in. in 10 ft. in direction of flow and shall be free from sags or pockets. No loop connections shall be used in return mains.

6. Floor Plates—Where pipes project through finished floors, ceilings or walls provide approved nickel plated floor or ceiling plates.

7. Vacuum Pump—Furnish and install vacuum pump as supplied by Jas. P. Marsh & Co. as shown on plan. Pump to have capacity of ...... sq. ft. of radiation, to be full automatic for .... volts, ... phase, ... cycle, to be duplex unit consisting of two pumps with their respective motors, one receiving tank, necessary float and automatic control, check valves, gate valves, switches, etc., for complete installation ready to run. Vacuum pumps shall be of air capacity and equipped with Marsh Compensating Controls to automatically maintain the necessary difference in pressure between supply and return with maximum of 15 in. of vacuum in supply side when full load of radiation is on.

8. Supply Control Valves—This contractor shall furnish and install supply control valves as furnished by Jas. P. Marsh & Co. and as shown on drawings. These valves shall be valved and by-passed as shown on plan. Where motorized by-pass valves are installed they shall be connected up ready to run, including all necessary wiring.

9. Control Panels—Install where shown on plans Marsh control panel having all necessary recording and indicating instruments and compensating governor, with all necessary switches and wiring and auxiliary piping completely installed by this contractor.

Where thermostats are used they shall be installed as recommended by Jas. P. Marsh & Co. and completely wired up to their respective motors.

10. Radiator Traps—Each radiator shall be provided with a Marsh Type W Compensating Radiator Trap of proper size as manufactured by Jas. P. Marsh & Co.

TAPPING SCHEDULE

Sqt. ft.	Valve	Trap
0– 30	½″ Type W	½″ No. W-1
31– 80	¾″ Type W	½″ No. W-1
81–125	1 ″ Type W	½″ No. W-1
126–175	1¼″ Type W	½″ No. W-2
176–250	1½″ Type W	½″ No. W-2

11. Radiator Valves—Each radiator shall be equipped with a Jas. P. Marsh & Co. Type W Flexcone Radiator Valve of proper capacity.

12. Radiation—Furnish and install radiation shown on plan. All radiation to be of approved make. Radiation shall be washed and cleaned at the factory and shipped equipped with wooden plugs in supply and return ends.

13. Hot Water Heaters—Returns from this equipment shall be either handled separately by a condensation pump direct to the boilers or shall be dripped into the vacuum return to heavy duty traps in accordance with manufacturer's instructions.

14. Ventilating Apparatus—Steam coils in connection with this type of apparatus shall be handled generally as is the hot water heating equipment.

15. Covering—Cover all steam mains and spring pieces with 1 in. thick asbestos sectional covering. Cover all fittings with asbestos cement. All piping run on outside walls or within 18 in. of same shall be covered with ½ in. thick asbestos covering. Cover boiler as specified by boiler manufacturer. Smoke pipe is to be covered with asbestos blocks wired on and finished smooth with coat of asbestos cement.

16. Painting—Where painting is included on this contract all exposed piping and radiators in finished rooms shall be given a priming coat of flat paint and thereafter painted or enameled as directed. Exposed parts on boiler to be given two coats of graphite paint.

17. Check Valves—Check valves shall be horizontal type with brass disc, best grade obtainable. They shall be installed where called for by plans and shall be tested for tightness before final connections are made.

18. Text for Tightness—The system when finished shall be tested for tightness in presence of a representative of Jas. P. Marsh & Co. A drop of 10 in. of vacuum in one hour will be allowed, measured from a maximum of 15 in. of vacuum secured when system is filled with steam. At this point the steam supply valve shall be closed, the pump stopped and at the end of an hour 5 in. of vacuum shall remain in the steam side of the system.

19. Guarantee—The heating contractor shall guarantee the apparatus installed to circulate steam thoroughly through every radiator without noise, with a vacuum of 15 in. in steam main. If the apparatus shall fail to accomplish this guarantee by reason of any defect developing within the period of one full heating season and that defect is due to faulty material or poor workmanship, the heating contractor shall remedy such defect at his own cost within reasonable time after notice thereof.

20. Inspection—Jas. P. Marsh & Co. will have a representative come on the job from time to time for inspection work and any instructions given by him in writing regarding changes shall be considered a part of this specification. The heating contractor must lend any assistance necessary in connection with these inspections.

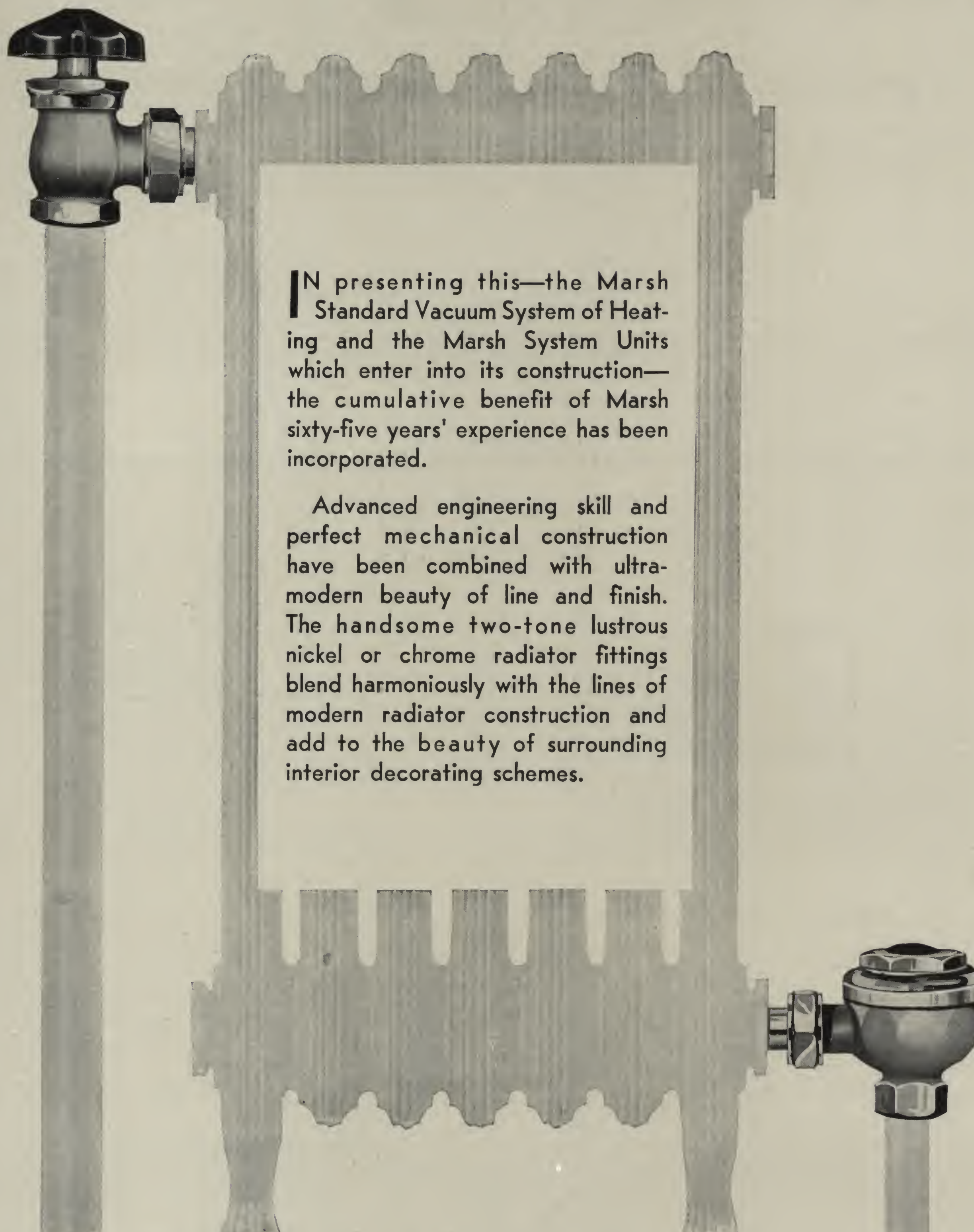
21. Finally—The true intent and meaning of these specifications is to bring about the satisfactory installation of a Marsh Weather Compensating System of Heating and nothing contained herein can be construed to relieve the contractor from making good and perfect the work in all usual details of construction, and he will be held responsible and bear all expenses incidental to the satisfactory completion of the work. Upon satisfactory completion and inspection, Jas. P. Marsh & Co. will issue to the heating contractor a certificate certifying correct installation and operation of the Marsh Compensating equipment, which certificate shall be executed in duplicate, one copy to be delivered by heating contractor to the architect.

THE MARSH STANDARD VACUUM SYSTEM OF HEATING

Bulletin No. 75

for Apartment Commercial and Public Buildings

JAS. P. **MARSH** & COMPANY
CHICAGO



IN presenting this—the Marsh Standard Vacuum System of Heating and the Marsh System Units which enter into its construction—the cumulative benefit of Marsh sixty-five years' experience has been incorporated.

Advanced engineering skill and perfect mechanical construction have been combined with ultra-modern beauty of line and finish. The handsome two-tone lustrous nickel or chrome radiator fittings blend harmoniously with the lines of modern radiator construction and add to the beauty of surrounding interior decorating schemes.

THE MARSH STANDARD VACUUM SYSTEM OF HEATING

THE Marsh Standard Vacuum System of Heating is a two pipe system, especially adaptable to the larger type of apartment buildings, office buildings, hospitals, and public buildings. With this type of system it is possible to circulate steam at low pressures, obtaining rapid circulation.

In this system it is necessary to mechanically create a vacuum on the return line, by means of a steam or electrically driven vacuum pump. The purpose of the vacuum pump is twofold: to purge the system of air, thereby reducing the pressure in the return lines, and to return the water of condensation back to the boiler. The system may be designed upfeed or downfeed, that is, to supply the radiators with steam from mains in the basement or by carrying a main riser to the attic and from there supplying the radiators with downfeed risers. Steam may be supplied from a boiler, central station, or by utilizing exhaust steam.

Design and Operation

In general this system is comprised of a generating unit, a system of supply mains and risers, a system of return lines connected to a vacuum pump. In operation steam is supplied from a steam header on the boiler, or from an outside source, as the case may be. Previous to the initial firing-up period the vacuum pump is started in order to purge the system of air present and by so doing steam will circulate rapidly throughout the supply mains. The supply mains are pitched in such a manner that water condensing in these mains will flow towards a terminus of the main and there it is dripped by a float and thermostatic drip trap. The result is that all accumulated air and water passes into the return line without allowing steam to enter the return system. From the supply mains a branch is taken off to supply the risers with steam, and in return the risers supply individual radiators through Marsh Packless Radiator Valves which can be controlled to supply the necessary amount of steam to produce the required amount of heat. As the steam enters the radiator it condenses. After giving up its heat to the radiator it is carried off into the return line through a Marsh System Unit Thermostatic Radiator Trap. After the radiator has been purged of all present air and water, steam comes in contact with the thermostatic element in the radiator trap, which in turn will expand to close off the trap, thus preventing steam from entering the return line. The water of condensation and air is automatically returned to the vacuum pump, due to the vacuum created in the return lines. As the air and water enter the receiving tank of the vacuum pump the air and water are separated, the air being expelled into atmosphere, the water returned by centrifugal force into the boiler.

Piping

It is important that both supply and return piping be graded not less than 1 inch in 20 feet so that the water of condensation will flow by gravity to the drip trap or the vacuum pump, as the case might be. Likewise great stress is placed upon the fact that the branches to supply and return risers and runouts to the radiators be graded not less than 1 inch in 5 feet, otherwise pockets will occur in the piping where water accumulates and prevent circulation and often cause hammering noises. It is likewise important that mains, risers and runouts be provided with some means of expansion. This is usually taken care of by providing a "swing" so that when expansion occurs the motion will be absorbed in the swing joint. And on up or downfeed systems the risers should be provided with an expansion joint or with an anchor so that the stress will be divided into two sections instead of one. It is equally important that runouts to radiators or offsets arranged in concrete grout be provided with sufficient means of expansion.

While radiators and piping may be located below the level of the vacuum pump it is not advisable. In such a case it is necessary to install a lift fitting at the vacuum pump, the purpose of which is to lift the water and air to the level of the suction strainer on the vacuum pump. Such a method greatly reduces the efficiency of the system and where possible we recommend that an accumulator tank be installed in lieu of the lift fitting. However, where lifts cannot be avoided the height of the lift should be kept down to a minimum.

A mistake is often made by covering the return mains in the basement. This should never be done inasmuch as covering the return mains will tend to retain the heat present in the water of condensation in the return main. The vacuum return line being covered, water cannot be cooled by circulating air and, therefore, due to its heat content under a vacuum, will cause the water to flash back into steam, thus killing the vacuum

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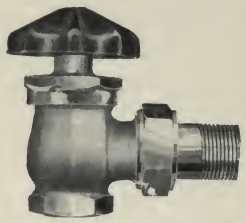
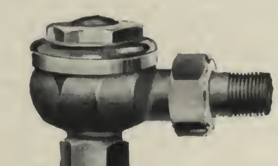
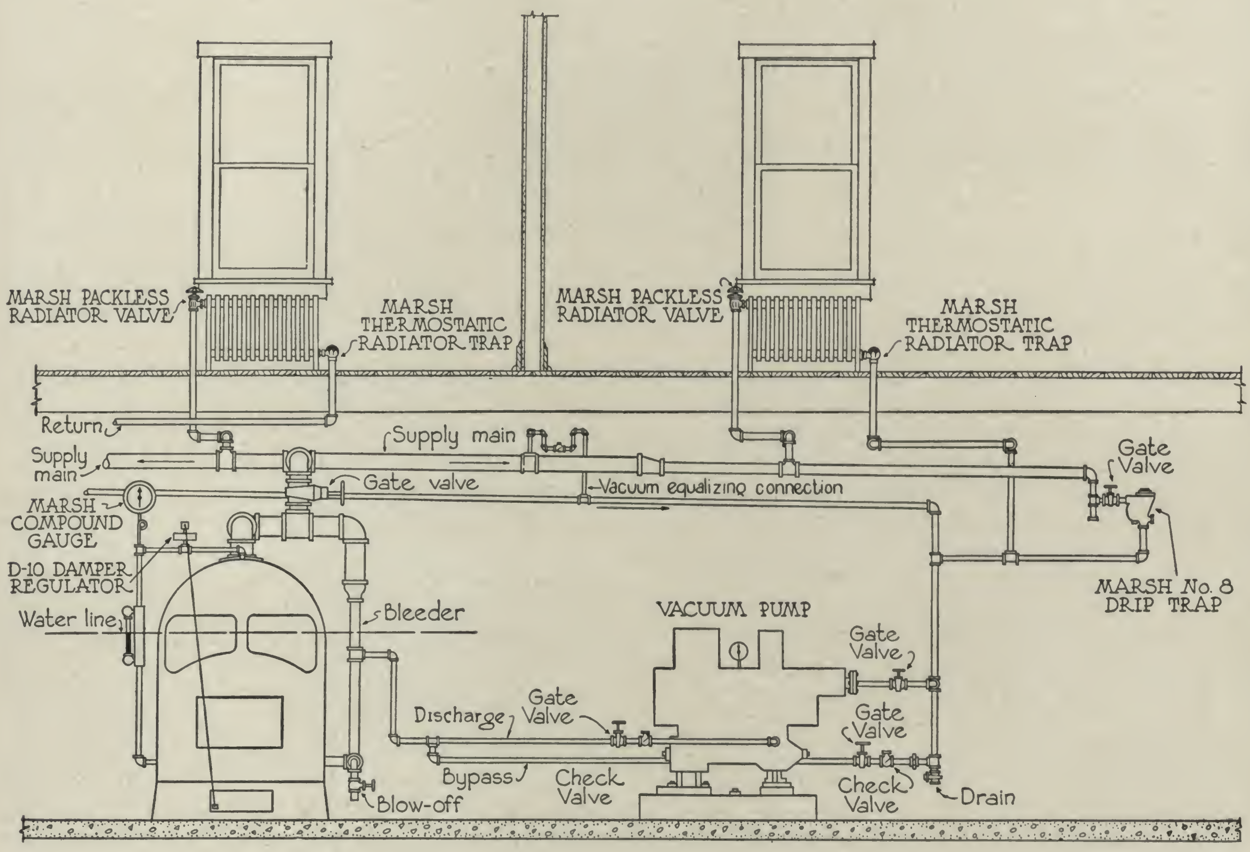
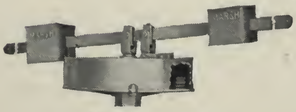
Typical Installation
Marsh Standard Vacuum System of Heating

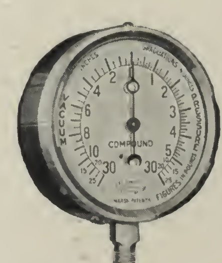
Showing Customary Arrangement of Marsh System Units


Marsh System Unit Radiator Valve


Marsh System Unit Radiator Trap




Damper Regulator



Compound Gauge


Marsh System Unit No. 8 Drip Trap


Marsh System Unit No. 12 Drip Trap

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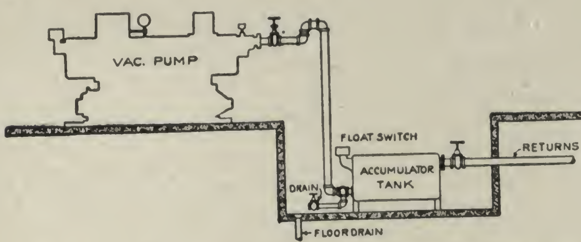
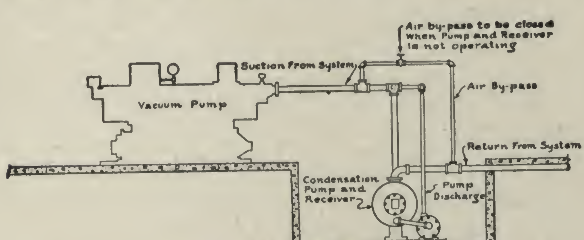


Installation Showing Accumulator Tank Substituted for Lift Fitting

present in the return line. Return piping should be left uncovered so that during its travel back to the vacuum pump, condensation will undergo a cooling process.

In operation the occasion frequently arises when, during the shut-down period, a natural vacuum is created in the boiler and supply lines exceeding that in the return system. Under this condition the water and air present in the return lines will be retarded to such a degree that they will not flow by gravity back to the vacuum pump. Result: the system becomes clogged up with water. To overcome this condition the Marsh Vacuum Systems employ an equalizing connection between the supply lines and the return lines. This device is intended to equalize any difference in vacuum between the supply and return systems which will tend to liberate the entrained water and air and permit it to flow by gravity to its terminus.

The arrangement of downfeed systems is somewhat different from that of an upfeed system. In the downfeed system the trunk line supplies steam to mains located in some advantageous point near the roof and from there the steam is distributed through downfeed risers terminating in the basement. In order to take care of the water and air



Method of Installing Booster Pump to Eliminate Lift

in these downfeed risers an individual drip trap must be placed at the base of each riser, which will allow passage of all water and air into a return line but prevent passage of steam. Another method is to collect all the individual downfeed risers into a common header or "bleeder line" which acts as an accumulator for the various risers. A system of piping is connected to the various risers and pitched towards the boiler room, at which point the bleeder line is dripped through a float and thermostatic drip trap. In this manner considerable piping is avoided and it has been found to be more easily accessible for cleaning due to the fact that in the latter there are but one or two traps to clean where in the former there may be quite a number to clean.

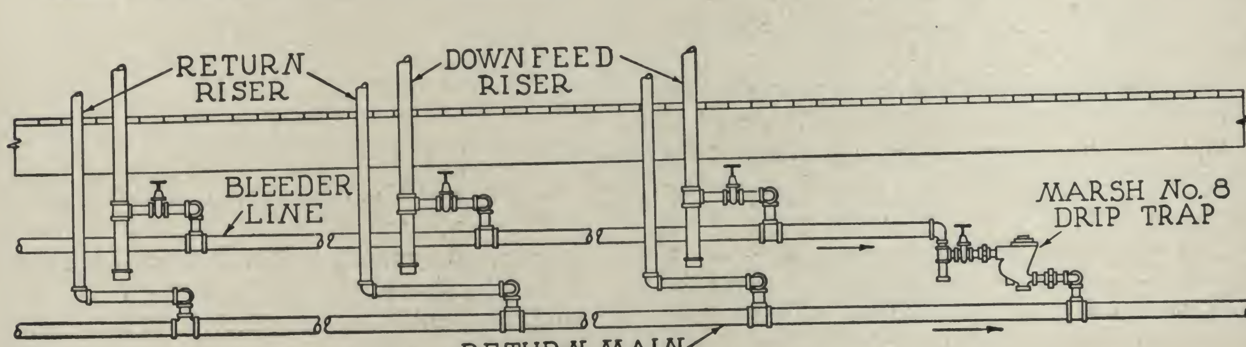
Also on this type of system where a main riser is employed it is important that this line either be dripped through a sufficient capacity float and thermostatic drip trap or by dripping it through a wet return direct to the boiler return header.

Hot Water Heaters and Vento

Occasionally on buildings employing this type of system, the system of ventilating utilizes Vento heaters as a medium for heating forced air. Where this type of heater is employed stress is laid upon air elimination. Manufacturers of Vento heaters usually recommend that heaters having 13 sections or less are to be equipped with an air line vent to handle air only and where the heaters have more than 13 sections that they be provided with a center vent in addition to the vent at the return outlet. The air line header should always be connected in the vacuum return line on the pump side of the drip trap.

Return piping from the return outlet of these heaters should always be full size of the opening and afterwards reduced should the occasion warrant. It is always advisable to provide the return from these heaters with a dirt strainer or a scale pocket as well as a swing check valve on some horizontal line between the drip trap and the return outlet. See diagram on following page.

Practically all modern buildings are equipped with hot water storage tanks heated by steam supplied from the heating boiler. Hot water storage tank should be located near the boiler.



Method of Dripping Downfeed Risers through a Bleeder Line

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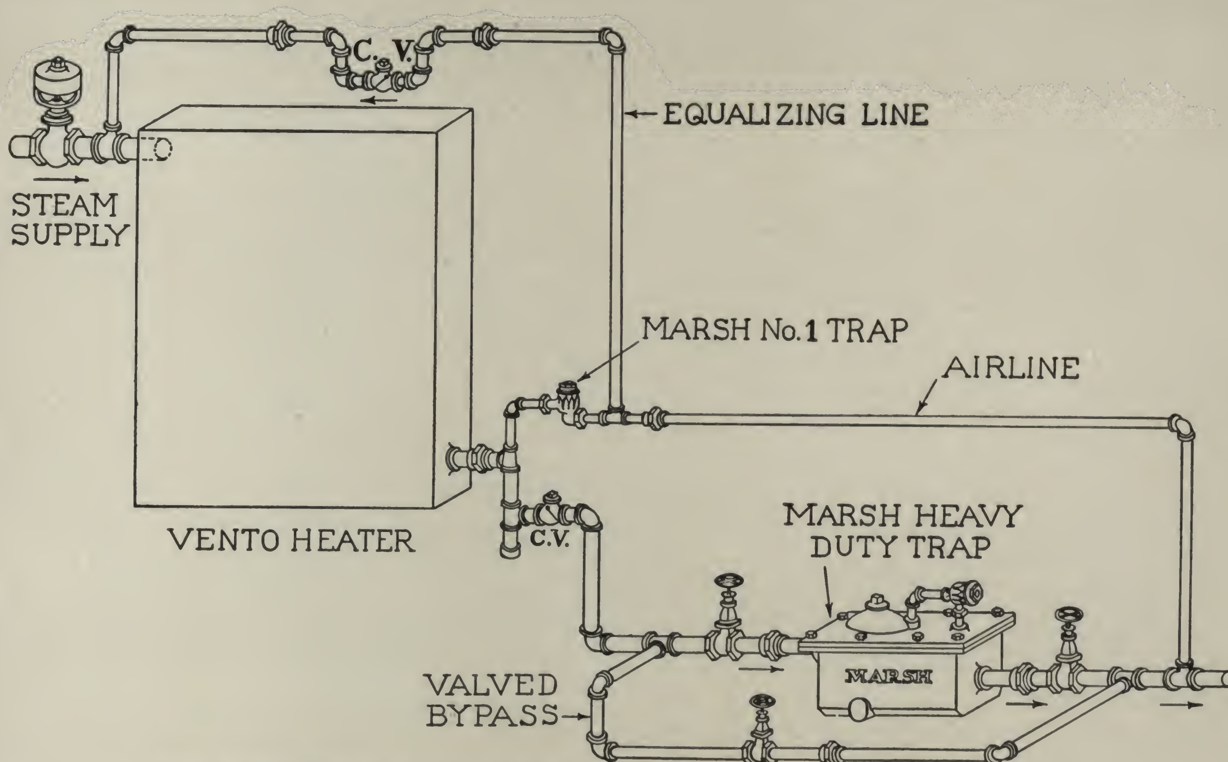


Typical Detail Showing Application of Marsh No. 9 Heavy Duty Trap to Vento Heaters

On both Vento and hot water heaters it is very important that the drip trap employed be of ample size to take care of the demands placed upon it during the initial start-up period. During the start-up period the amount of condensation is much greater and the traps should therefore be based upon the amount of condensation emitted during this period. See lower right hand drawing.

Vacuum Pump

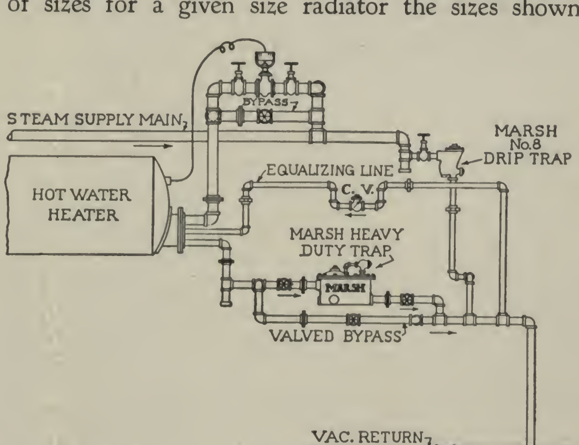
A very important factor in this type of heating is the vacuum pump. Its function is to keep the return line free from air and water and therefore the capacity of the pump should be calculated to handle not only the water of condensation but also air. As a general rule these two factors are taken into consideration by pump manufacturers and the manufacturers' ratings in square feet of equivalent direct radiation may be used safely.

However, for all practical purposes the condensation rate can be estimated at 0.25 pound of water per square foot of direct radiation and the air volume to be handled as 0.30 cubic foot of air per 100 square feet of direct radiation.

As previously stated the system should be designed so that lifts can be avoided, but where the design of the building necessitates a lift it is advisable to use an accumulator tank. Vacuum pumps should always be provided with a by-pass so that the system may be run without the pump if the occasion should arise. The discharge pressure of the pump should be sufficiently well above the intended pressure to be carried in the boiler.

Valve and Trap Capacity

Marsh Packless Radiator Valves are designed to give a full capacity steam flow and for selection of sizes for a given size radiator the sizes shown in the typical specifications may be used. Likewise, the Marsh Thermostatic Radiator Traps are designed to expel the maximum amount of condensation and air and the sizes as shown in the typical specifications may be used.



Application of Marsh No. 9 Heavy Duty Trap to Hot Water Heaters

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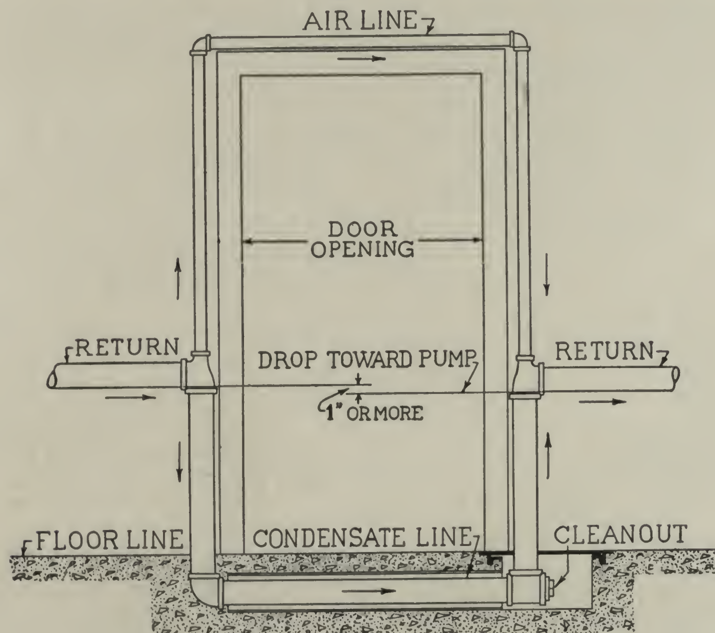
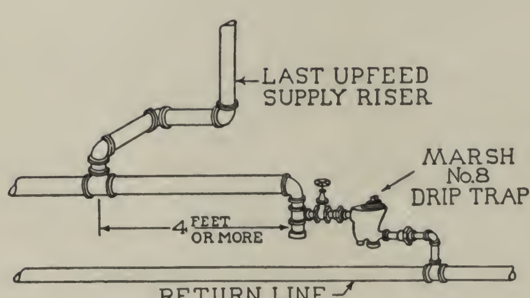
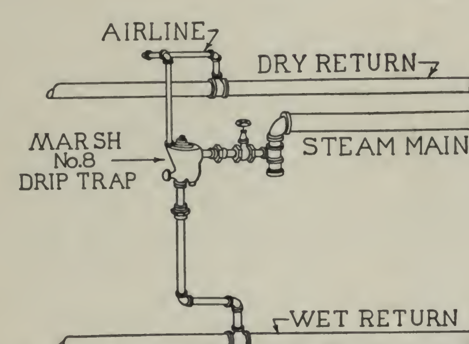
Installation Details
Marsh Vacuum System of Heating



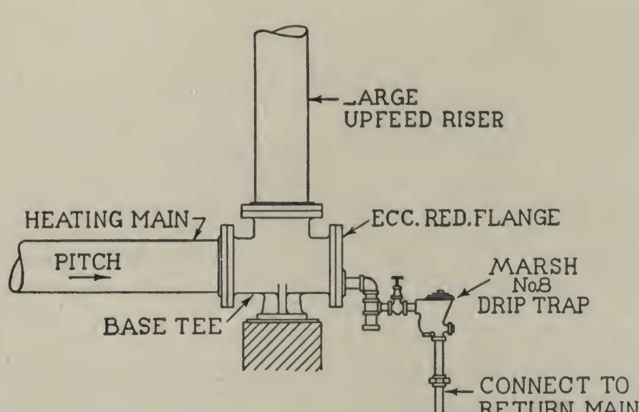
Standard Method of Looping Return Mains under Door Openings



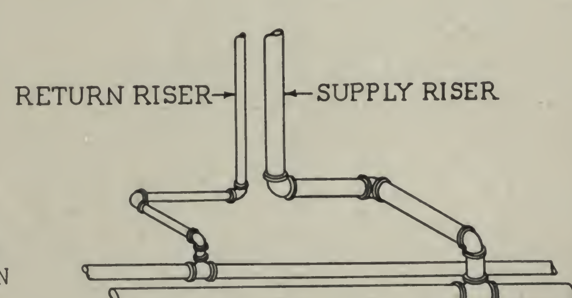
Method of Dripping Steam Mains into Dry Return



Method of Dripping Steam Main into Wet Return with Air Line to Dry Return



Typical Connections for Dripping Upfeed Steam Risers



Typical "Swing" Joint

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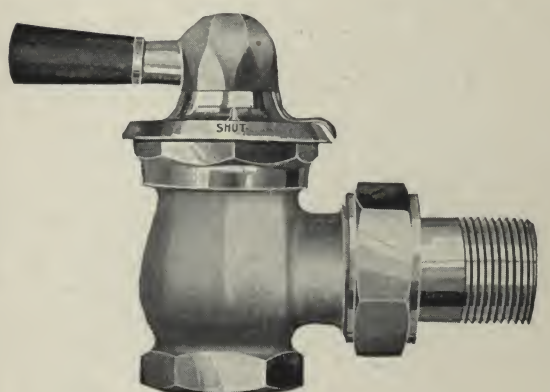
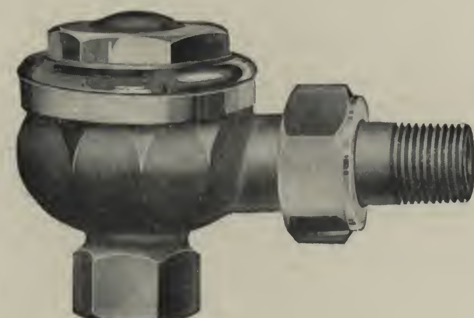
Marsh System Units

The following pages are devoted to a description of the Marsh System Units entering into the Marsh Standard Vacuum System of Heating. Realizing that a heating system is no better than the units which enter into the building of it, Jas. P. Marsh & Company has utilized its many years of experience to develop the highest possible degree of accuracy and perfection in these units.

The Marsh System Units described in the following pages are most modern in design and in principle of operation. Beauty is featured in these units where beauty should be found, yet efficiency in operation and sturdiness of design has been the prime object in their production.





Marsh System Unit Radiator Valve

This unit, the Marsh Radiator Supply Valve, functions to control the operation and heat output of the individual radiator. As supplied in the illustrated graduated pattern the valve can be operated to restrict the flow of steam and as a result the heat output of the individual radiator as required. Also to shut off valve or to open full.

The octagonal body lines of the Marsh System Unit Radiator Valve blend perfectly with the body lines found in the modern tubular radiator, and as installed on the radiator in combination with the Marsh System Unit Radiator Trap, has a decided effect upon the appearance of the radiator as a whole. In direct contrast with surrounding interior decorations, the Marsh System Unit Radiator Valve stands out in pleasing relief in a two-tone chrome or nickel finish; the body in satin chrome and the bonnet and tailpiece in polished finish. A handle of futuristic design crowns the Marsh Radiator Valve, lending itself to easy opening or closing of the valve.

The interior construction of this valve is unique, utilizing two monel metal discs and two stainless steel discs as the packless feature, which makes possible the elimination of the conventional spring, composition packing glands, bellows or multiple diaphragms found in most radiator valves today.

Data on valve extensions and other accessories are given in Bulletin No. 150.

Marsh System Unit Radiator Trap

These traps, through their thermostatic action, retain the steam in the radiator until it has given up its heat and finally condenses into water. They also eliminate air and water from a radiator without passing steam—a very important factor in a vacuum system.

The action of the trap is entirely automatic. It is operated by heat and continues to function as long as steam flows to the radiator.

The operating element is a phosphor bronze diaphragm containing a combination of volatile fluids which expand and contract with heat, opening and closing the valve needle.

The body is of cast steam brass with two-tone satin and polished nickel or chrome finish.

Marsh System Unit Radiator Traps are built along octagonal body lines to blend with the Marsh System Unit Radiator Valve in perfect harmony with modern tubular radiation. This unit fits into a perfect blend with surrounding interior decorating schemes.

Marsh Thermostatic Traps are made in two sizes and types indicated by Series No. 1 and No. 2. They are used according to the size of the radiator, and operate automatically from below atmosphere to 25 pounds steam pressure.

Additional data on construction and types is given in Bulletin No. 175.

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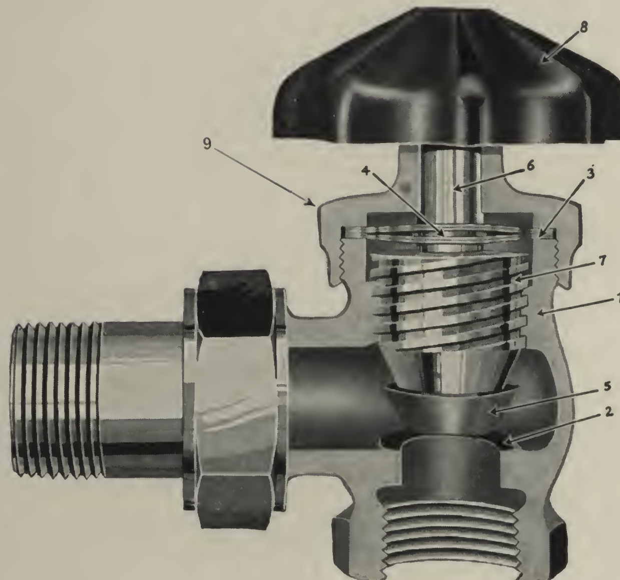
View Showing Interior and Construction of the Marsh System Unit Packless Radiator Valve



1—Valve Body

2—Valve Seat

3—Metalflex Sealing Discs

4—Stem Collar

5—Flexcone Valve Disc

6—Valve Stem

7—Thrust Screw

8—Bakelite Handle

9—Valve Bonnet

View Showing Interior and Construction of the Marsh System Unit Radiator Trap

1—Trap Bonnet

2—Trap Body

3—Thermostatic Diaphragm

4—Diaphragm Reinforcement

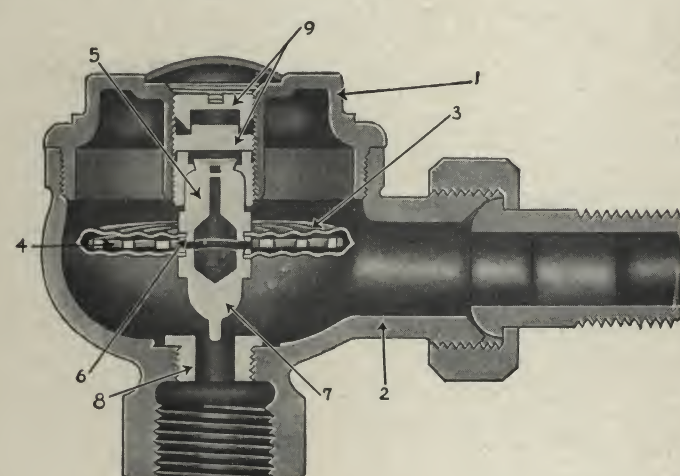
5—Swivel and Adjustment

6—Diaphragm Locking Seal

7—Valve Needle

8—Removable Seat

9—Adjustment Seal



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Marsh System Unit Drip Traps

Marsh No. 8 Drip Trap

This trap is continuous in discharge and is designed to quickly remove condensation and air from drip points on steam mains, steam risers, steam coils, or blast heaters, or for any like service within the capacity of the trap.

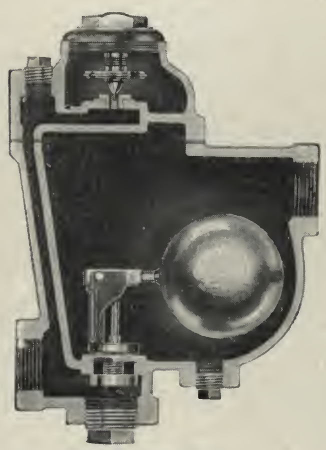
The design permits a deep water seal on the discharge valve. This water discharge valve is float controlled and located at a low point in the bottom of the trap and air is removed through a thermostatically controlled port in the cap of the trap. The thermostatic member used is our standard assembly as in the No. 1 Marsh Radiator Trap. Normally air is discharged through a port directly to the outlet connections of the trap. In cases where the trap may be required to discharge to a wet return the air discharge may be connected to a dry return from a special opening tapped in the cap of the trap.

Body of trap is provided with one 1¼-inch tapped inlet and two 1¼-inch tapped outlet openings. These openings are located so as to permit direct connection both to inlet and from outlet.

The trap may be suspended directly in the piping and no other supports are necessary. The thermostatic element screws directly in the cap of the trap and is interchangeable with the element from the No. 1 Radiator Trap.

All interior parts are of forged bronze castings with the exception of the float which is a seamless copper float tested for a working pressure of 25 pounds per square inch.

Copper asbestos gaskets are used throughout which avoid the necessity of supplying new gaskets whenever trap may be opened for inspection or repair.



No. 8 Drip Trap

CONNECTION SIZES

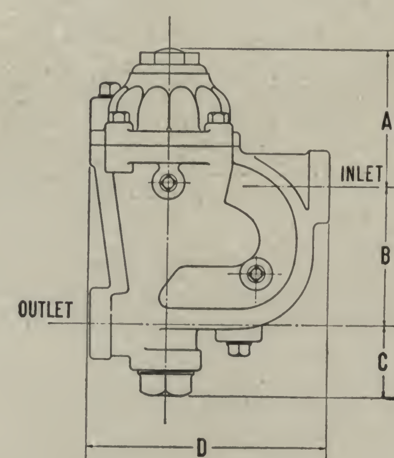
1¼-in. Inlet
1¼-in. Outlet

DIMENSIONS

A—4⅜ in.
B—4⅛ in.
C—2¼ in.
D—7 11/16 in.

CAPACITIES

Steam pressure in lb.	Capacities in lb. water per hr.
½	500
1	900
2	1400
3	1600
4	1800
5	2000
10	3200
15	4000



Marsh No. 12 Drip Trap

Designed for removal of air and condensation from short steam mains, branches or riser. Unit heaters, steam coils, etc., are within the limits of the capacity of the trap.

The size and weight of the trap permits its installation in the piping without any other means of support.

Condensation is removed through a float operated valve located at the lowest point inside the trap body. Air removal is located in the cap of the trap. Air passes through a passageway and out through the trap outlet.

Body of trap is of cast iron and all interior parts are of forged steam bronze, copper and monel metal.

The thermostatic member of the air by-pass is interchangeable with the member of the standard No. 1 Radiator Trap.

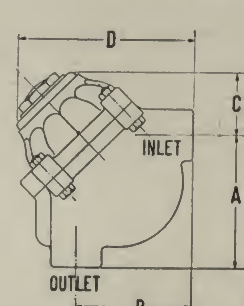
No. 12 Drip Trap

CONNECTION SIZES

¾-in. Inlet
¾-in. Outlet

DIMENSIONS

A—4½ in.
B—3⅞ in.
C—1⅞ in.
D—6 in.



CAPACITIES

Steam pressure in lb.	Capacities in lb. water per hr.
½	350
1	600
2	800
3	1200
4	1400
5	1600
10	2000
15	2800

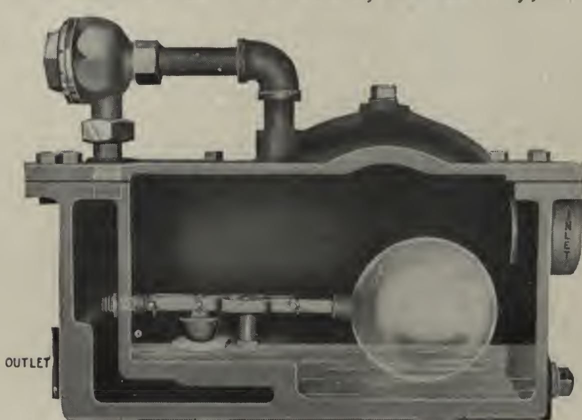
Continued on next page

Marsh System Unit
No. 9 Heavy Duty Trap

The Marsh No. 9 Heavy Duty Trap has a wide field in which it may be applied to equipment using steam as a heating element. This trap was designed especially for services where very large volumes of water and air must be taken care of as rapidly as possible, adding greatly to the efficient operation of the equipment upon which it is applied during the initial starting-up period.

It has a marked place in the service in conjunction with storage hot water heaters and Vento heaters where the rapid elimination of water and air is important.

On Vento service the problem of condensation is somewhat different. On Vento two factors must be taken into consideration. First, the temperature of the outside air to be heated, and secondly, the



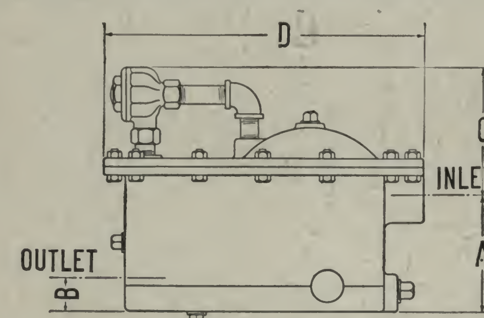
condensation to be emitted during the initial start-up period. For all practical purposes the chart below will indicate equivalent pounds of condensation to be calculated in computing heavy duty sizes for various outside temperatures.

Although modern methods dictate that separate air lines are incorporated on Vento to handle air only the Marsh No. 9 Heavy Duty Traps are equipped with a thermostatic by-pass to take care of any remaining air. However, for estimating purposes the air to be handled in Vento may be computed as 0.30 cubic foot of air per 100 square feet of equivalent radiation.

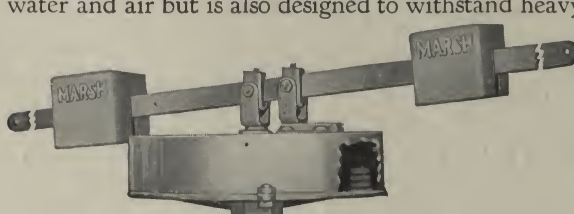
In construction the Marsh No. 9 Heavy Duty Trap is built to not only handle large volumes of water and air but is also designed to withstand heavy duty service. The body proper is of heavy cast iron, equipped with a removable cover. Extra proportions of metal are placed at the inlet and outlet stress points and it is also equipped with a plugged connection for draining. The entire float mechanism is of non-corrosive metals and so arranged to permit through passage of water. The ball float is of large proportions of heavy copper, designed to withstand pressures up to 25 pounds. The valve and valve seats are so arranged that at all times they are water sealed and likewise prevent accumulation of dirt interfering with a tight seat. As an integral part of the cover the Marsh No. 1 Series Thermostatic Trap is incorporated as a means of eliminating accumulated air. This unit is rigidly attached to the cover, permitting the entire cover and thermostatic trap to be taken off should it be necessary to remove the cover for cleaning.

CAPACITIES

Size	Orifice	½ lb.	1 lb.	2 lb.	3 lb.	4 lb.	5 lb.
9-C	¾″	1800 lb.	3150 lb.	4442 lb.	5284 lb.	6249 lb.	6955 lb.
9-D	⅞″	2620 lb.	4345 lb.	6125 lb.	7435 lb.	8613 lb.	9576 lb.
9-E	1 ″	3327 lb.	5676 lb.	8024 lb.	9778 lb.	11286 lb.	12517 lb.
9-F	1⅛″	4239 lb.	7197 lb.	12303 lb.	14256 lb.	15823 lb.	22228 lb.

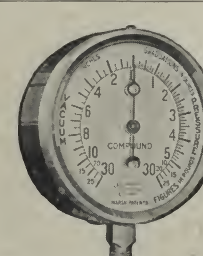


Size	Connections	A	B	C	D
9-C 9-D	1 ″ 1¼″	5½″	1½″	5 15/16″	14½″
9-E 9-F	1½″ 2 ″	5⅝″	1¾″	6½″	16¼″



Type D-10 Damp Regulator

This device functions to control the dampers on hand fired coal boilers. A lever arm is automatically actuated to control the dampers.



No. 83 Compound Retard Gauge

Marsh Gauges of this or some similar type come as standard equipment on many makes of the most widely used boilers. A sensitive gauge is essential to satisfactory operation of any boiler. The Marsh Compound Retard Gauge is graduated in ounces of pressure and fractions of an inch vacuum permitting perfect reading.

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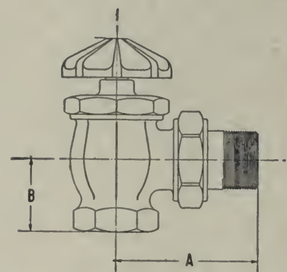
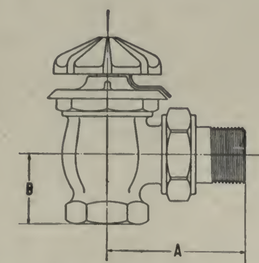
Patterns and Roughing-in Dimensions of Marsh System Unit Packless Radiator Valves



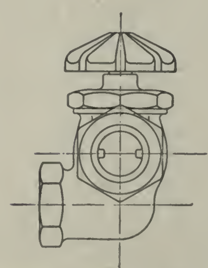
No. 100-A (Wheel Angle)

DIMENSIONS IN INCHES

Sizes	A	B
1/2"	2 3/8"	1 3/16"
3/4"	2 7/8"	1 3/16"
1 "	3 1/8"	1 9/16"
1 1/4"	3 5/8"	1 3/4"
1 1/2"	3 7/8"	1 1/2"
2 "	4 3/8"	2 3/8"



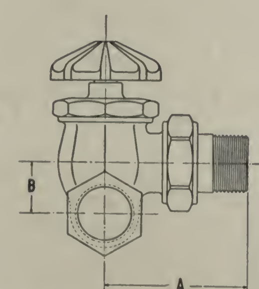
No. 101-A (Wheel Angle—Graduated)



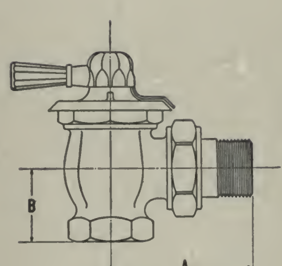
No. 100-L (Wheel Left Hand Corner)

DIMENSIONS IN INCHES

Sizes	A	B
1/2"	2 3/8"	3/4"
3/4"	2 7/8"	27/32"
1 "	3 1/8"	7/8"
1 1/4"	3 5/8"	1 1/8"
1 1/2"	3 7/8"	1 1/4"
2 "	4 3/8"	1 1/2"



No. 100-R (Wheel Right Hand Corner)



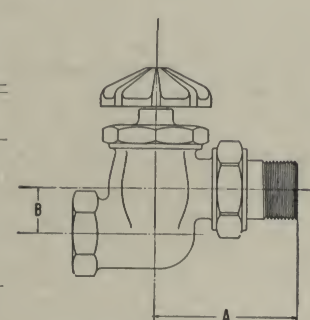
No. 102-A (Lever Handle)

DIMENSIONS IN INCHES

Sizes	A	B
1/2"	2 3/8"	1 3/16"
3/4"	2 7/8"	1 3/16"
1 "	3 1/8"	1 9/16"
1 1/4"	3 5/8"	1 3/4"
1 1/2"	3 7/8"	1 1/2"
2 "	4 3/8"	2 3/8"

DIMENSIONS IN INCHES

Sizes	A	B
1/2"	1 3/8"	2 3/8"
3/4"	1 3/8"	2 7/8"
1 "	1 11/16"	3 1/8"
1 1/4"	2 "	3 5/8"
1 1/2"	2 3/8"	3 7/8"
2 "	3 1/16"	4 3/8"



No. 100-B (Back Offset)

Explanation of Dimensional Tables

Type No. 101 (wheel handle) and Type No. 102 (lever handle) graduated valves as made in left hand corner pattern, right hand corner pattern and back offset pattern have the same roughing-in dimensions shown above for the Type 100 valves in these patterns.

Roughing-in dimensions for Type Nos. 103 Lock and Shield Packless Valve and 104 Lock and Shield Graduated Valves in all patterns are the same as Type No. 100.

TYPES AND PATTERNS OF MARSH SYSTEM UNIT RADIATOR VALVES

Type	Pattern	Symbol	Type	Pattern	Symbol
Wheel Handle	Angle	100-A	Lever Handle Graduated	Angle	102-A
Wheel Handle	Left Hand Corner	100-L	Lever Handle Graduated	Left Hand Corner	102-L
Wheel Handle	Right Hand Corner	100-R	Lever Handle Graduated	Right Hand Corner	102-R
Wheel Handle	Back Offset	100-B	Lever Handle Graduated	Back Offset	102-B
Wheel Handle Graduated	Angle	101-A	Lock and Shield	Angle	103-A
Wheel Handle Graduated	Left Hand Corner	101-L	Lock and Shield	Left Hand Corner	103-L
Wheel Handle Graduated	Right Hand Corner	101-R	Lock and Shield	Right Hand Corner	103-R
Wheel Handle Graduated	Back Offset	101-B	Lock and Shield	Back Offset	103-B

Note: Lock and shield construction can also be supplied in the graduated type valve—specified as No. 104—in any pattern listed above.

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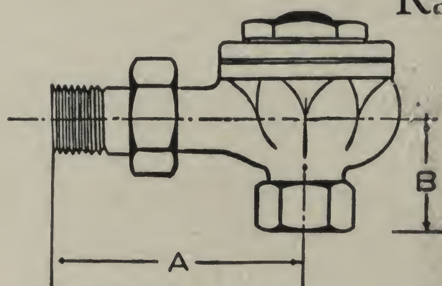
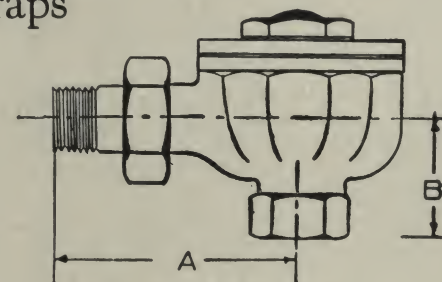
Roughing-in Dimensions of Marsh System Unit Radiator Traps



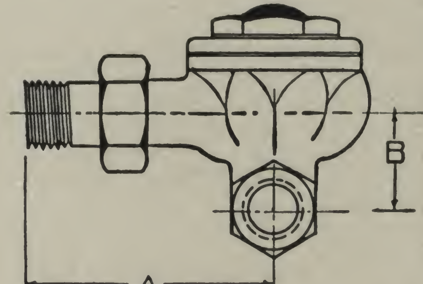
No. 1-A (Angle Pattern)

Size	Capacity	Water	A	B
½"	150 sq. ft.	40 lbs. per hour	3¼"	1½"



No. 2-A (Angle Pattern)

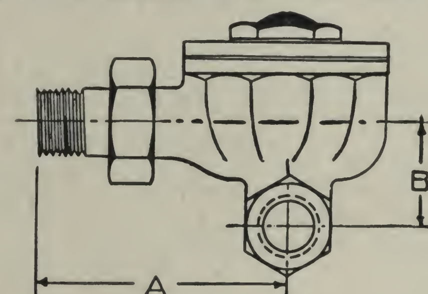
Size	Capacity	Water	A	B
½"	200 sq. ft.	50 lbs. per hour	3½"	1 7/16"
¾"	500 sq. ft.	125 lbs. per hour	3 15/16"	2 "
1 "	1000 sq. ft.	250 lbs. per hour	4⅜"	2 1/16"



No. 1-R (Right Hand) and No. 1-L (Left Hand Corner Pattern)

Size	Capacity	Water	A	B
½"	150 sq. ft.	40 lbs. per hour	3¼"	1¼"

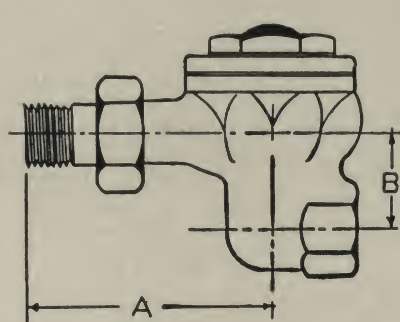
Dimensions on right and left hand pattern are identical.



No. 2-R (Right Hand) and No. 2-L (Left Hand Corner Pattern)

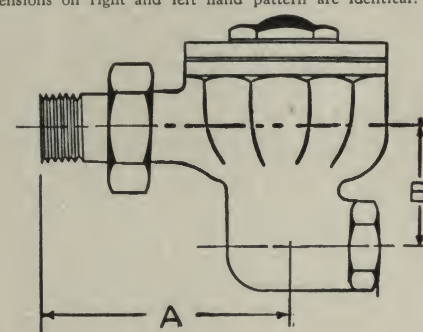
Size	Capacity	Water	A	B
½"	200 sq. ft.	50 lbs. per hour	3¾"	1¼"
¾"	500 sq. ft.	125 lbs. per hour	3 15/16"	1⅝"
1 "	1000 sq. ft.	250 lbs. per hour	4 5/16"	1⅞"

Dimensions on right and left hand pattern are identical.



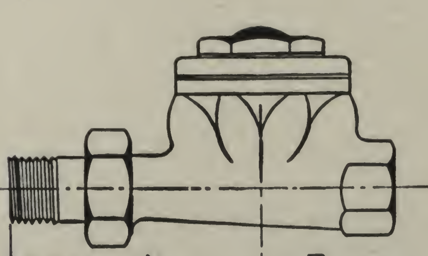
No. 1-B (Back Offset Pattern)

Size	Capacity	Water	A	B	C
½"	150 sq. ft.	40 lbs. per hour	3¼"	1¼"	1⅛"



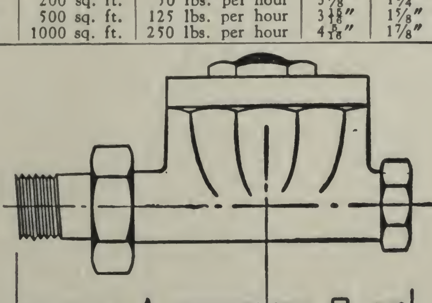
No. 2-B (Back Offset Pattern)

Size	Capacity	Water	A	B	C
½"	200 sq. ft.	50 lbs. per hour	3⅞"	1¼"	1⅜"
¾"	500 sq. ft.	125 lbs. per hour	3 15/16"	1⅝"	1 9/16"
1 "	1000 sq. ft.	250 lbs. per hour	4 5/16"	1⅞"	1⅝"



No. 1-S (Straightway Pattern)

Size	Capacity	Water	A	B
½"	150 sq. ft.	40 lbs. per hour	3¼"	1¾"



No. 2-S (Straightway Pattern)

Size	Capacity	Water	A	B
½"	200 sq. ft.	50 lbs. per hour	3¾"	2"

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Typical Specifications for Marsh Standard Vacuum System of Heating

1. General Conditions—The general conditions governing this portion of the work shall be in accordance with those of the American Institute of Architects and installation shall be in accordance with standard practices of the local association of contractors.

2. Scope of Work—The work to be done includes the furnishing of all labor and materials for the complete installation of a Marsh Vacuum System of Heating as hereinafter specified and as shown on drawings. Work to be done shall be executed in a neat and workmanlike manner, and all apparatus pertaining to this portion of the work to be of the best grade materials and shall strictly conform to these specifications.

3. Boiler—Boiler shall be a..................... with guaranteed rating for .... sq. ft. of radiation and shall contain .... sq. ft. of heating surface. Boiler shall be installed upon suitable foundation and equipped with all necessary connections and trimmings, including Marsh Compound Gauge, Kunkle Pop Safety Valve and Type D Damper Regulator. For automatic stoker, oil or gas-fired boilers provision shall be made for connection of this apparatus to boiler in accordance with manufacturer's instructions.

4. Smoke Pipe—Connect boiler to chimney with suitable smoke pipe of .... gauge black steel, of size as recommended by boiler manufacturer.

5. Pipe and Fittings—Contractor shall furnish and install where indicated on plans all pipe and fittings properly supported and graded to insure a complete and successful operation of the system. Joints to be made up with a paste consisting of Portland cement and boiled linseed oil applied to male threads only. Proper provision to be made for expansion in all mains, risers and branches. Boiler header shall be made up of standard flanged fittings connected to boiler full size of steam opening, same to be dripped to return header through a bleeder. All spring pieces to steam and return mains shall be taken out of top of mains at 45 deg. on upfeed systems and out of bottom of steam mains at 90 deg. on downfeed systems.

Supply mains shall be graded to ½ in. in 10 ft. away from boiler and dripped through Marsh No. 8 Drip Traps. Runouts or branches to radiators or risers to be graded not less than 1 in. in 10 ft. towards supply mains.

Return mains shall be graded 1 in. in 10 ft. in direction of flow and shall be free from sags or pockets. No loop connections shall be used in return mains.

6. Floor Plates—Where pipes project through finished floors, ceilings or walls provide approved nickel plated floor or ceiling plates.

7. Vacuum Pump—Furnish and install vacuum pump as shown on plan. Pump to have capacity of .... sq. ft. of radiation to be full automatic for ..... volts, ... phase, ... cycle. Pump to be unit consisting of pumps with their respective motors, one receiving tank, necessary float and automatic control, with check valves, gate valves, switches, etc. for complete installation ready to run.

8. Radiator Traps—Each radiator shall be provided with a Marsh System Unit Radiator Trap of proper size as manufactured by Jas. P. Marsh & Co.

9. Radiator Valves—Each radiator shall be equipped with a Jas. P. Marsh & Co. System Unit Flexcone Radiator Valve of proper size.

10. Radiation—Furnish and install radiation shown on plan. All radiation to be of approved make with air valve tapping plugged. Radiation shall be washed and cleaned at the factory and shipped equipped with wooden plugs in supply and return ends.

TAPPING SCHEDULE

Sq. ft.	Valve	Trap
0– 30	½″	½″ No. 1
31– 80	¾″	½″ No. 1
81–125	1 ″	½″ No. 1
126–175	1¼″	½″ No. 2
176–250	1½″	½″ No. 2
250 up	2 ″	¾″ No. 2

11. Hot Water Heaters—Returns from this equipment shall be either handled separately by a condensation pump direct to the boilers or shall be dripped into the vacuum return to Marsh No. 9 Heavy Duty Traps in accordance with manufacturer's instructions. In this latter case condensation shall be passed through an economizer located as shown.

12. Ventilating Apparatus—Steam coils in connection with this type of apparatus shall be handled generally as is the hot water heating equipment.

13. Covering—Cover all steam mains and spring pieces with 1 in. thick asbestos sectional covering. Cover all fittings with asbestos cement. All piping run on outside walls or within 18 in. of same shall be covered with ½ in. thick asbestos covering. Cover boiler as specified by boiler manufacturer. Smoke pipe is to be covered with asbestos blocks wired on and finished smooth with coat of asbestos cement.

14. Painting—Where painting is included on this contract all exposed piping in finished rooms shall be given a priming coat of flat paint and thereafter painted or enameled as directed. Radiators shall be painted as directed. Exposed parts on boiler to be given two coats of graphite paint.

15. Check Valves—Check valves shall be horizontal type with brass disc, best grade obtainable. They shall be installed where called for by plans and shall be tested for tightness before final connections are made.

16. Test for Tightness—The system when finished shall be tested for tightness. A drop of 10 in. of vacuum in one hour will be allowed, measured from a maximum of 15 in. of vacuum secured when system is filled with steam. At this point the steam supply valve shall be closed, the pump stopped and at the end of an hour 5 in. of vacuum shall remain in the steam side of the system.

17. Guarantee—The heating contractor shall guarantee the apparatus installed to circulate steam thoroughly through every radiator without noise. If the apparatus shall fail to accomplish this guarantee by reason of any defect developing within the period of one full heating season and that defect is due to faulty material or poor workmanship, the heating contractor shall remedy such defect at his own cost within reasonable time after notice thereof.

18. Finally—The true intent and meaning of these specifications is to bring about the satisfactory installation of a Marsh Vacuum System of Heating and nothing contained herein can be construed to relieve the contractor from making good and perfect the work in all usual details of construction, and he will be held responsible and bear all expenses incidental to the satisfactory completion of the work.

THE MARSH VAPOR SYSTEM OF HEATING

Bulletin No. 100

for
Residential
Small
Apartment
and
Public
Buildings

JAS. P. **MARSH** & COMPANY
CHICAGO

THE vapor system of heating has been long recognized as most feasible for application to residential and other types of smaller structures. In presenting this, the new Marsh Vapor System of Heating, Jas. P. Marsh & Company makes another valuable contribution to the art of heating. The improved devices and methods portrayed render this vapor system the ideal method of small structure heating.

Perfect mechanical construction and methods have now been combined with ultra-modern beauty of line and finish. The handsome two-tone lustrous nickel or chrome radiator units blend harmoniously with the lines of modern radiator construction and add to the beauty of surrounding interior decorating schemes.

THE MARSH VAPOR SYSTEM OF HEATING

DIFFICULTIES heretofore encountered in gravity heating systems have caused a rapid development in recent years of the vapor systems of heating. This type of system, because of its simplicity of design and ease of operation, makes it especially adaptable in residences, stores and apartment buildings covering a moderate area. Its efficiency as a heating element has been definitely established in modern heating.

The ability to generate heat as it is needed to meet outside weather conditions with a minimum amount of fuel and attention, with maximum efficiency and utmost simplicity, constitutes the appeal of the Marsh Vapor System. This system is a two pipe system, which circulates vapors at very low pressures —silent and unfailing in operation.

On single pipe systems it is necessary for the water of condensation (condensed steam) to pass out through the same inlet valve through which it entered the radiator as steam. This method reduces the efficiency of heat output and makes it necessary to generate sufficient steam to create a pressure in order to circulate heat throughout the system.

As the steam and water attempt to pass each other they create a pounding noise, a detriment in any heating system. The air contained within the radiator must be expelled through an air valve located on the radiator directly into the living quarters.

The result is a needless waste of fuel, loss in efficiency, unnecessary noises and undesirable atmosphere produced by the escape of air from the air valve.

Advantages of the Marsh Vapor System

In the Marsh Vapor System these defects are entirely overcome. Due to its simplicity of piping arrangement, vapor may be generated at as low as four ounces pressure and still circulate sufficient vapor throughout the supply system to produce a radiator heat output that corresponds directly to heat demand in mild weather. By so generating vapor under low pressures, an economy in fuel consumption is effected. Due to its flexible efficiency the Marsh Vapor System can be operated to meet sudden demands for more or less heat as outside weather conditions change. The amount of vapor delivered to the radiators can be controlled by opening the Marsh radiator valves installed on these radiators to one-quarter, one-half, three-quarters or full open position, based upon the amount of heat required.

By manipulating the radiator valve this action is automatically transmitted to a sensitive damper regulator on the generating unit, closing or opening the drafts as weather conditions warrant. For instance, should there be a sudden lowering of outside temperature, demanding more heat in the rooms, the occupant will naturally open the radiator valve to its full opening, admitting more vapor to the radiator and increasing the heat output. Admitting more vapor to the radiator will tend to decrease the pressure in the generating unit, which will automatically manipulate the damper regulator to opening the draft door. In this manner a brisk fire is created and the pressure in the generating unit increased by several ounces, until it reaches a predetermined point. When this point is reached the damper regulator automatically closes the draft damper and opens the check damper, preventing further excessive generation of vapor. Likewise, the reverse: when the radiator valves are partially closed the damper regulator operates the dampers in such a manner that no more vapor is generated than may be required by prevailing weather conditions.

The Marsh Vapor System Units form the basis of simplified and automatic control. They positively eliminate air binding which is the cause of much inefficient heat distribution, and they likewise eliminate the necessity of an air valve on the radiator. They spread circulation of vapor to the radiators and require a lower initial pressure to achieve circulation. They make the system noiseless, assure the quality of safety, permit minimum sizes of piping, avoid complexity of design and widen the scope of application of this system to the most serious heating problem. This system has a direct appeal to the operator due to its flexibility, economy, simplicity, and ease of operation.

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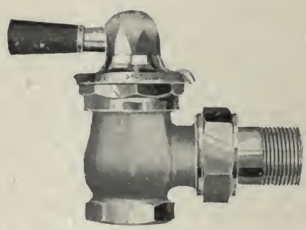
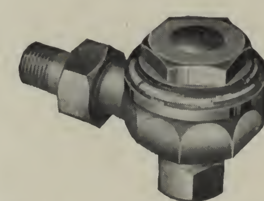
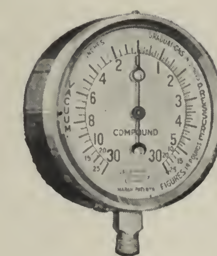
Typical Installation
Marsh Vapor System of Heating

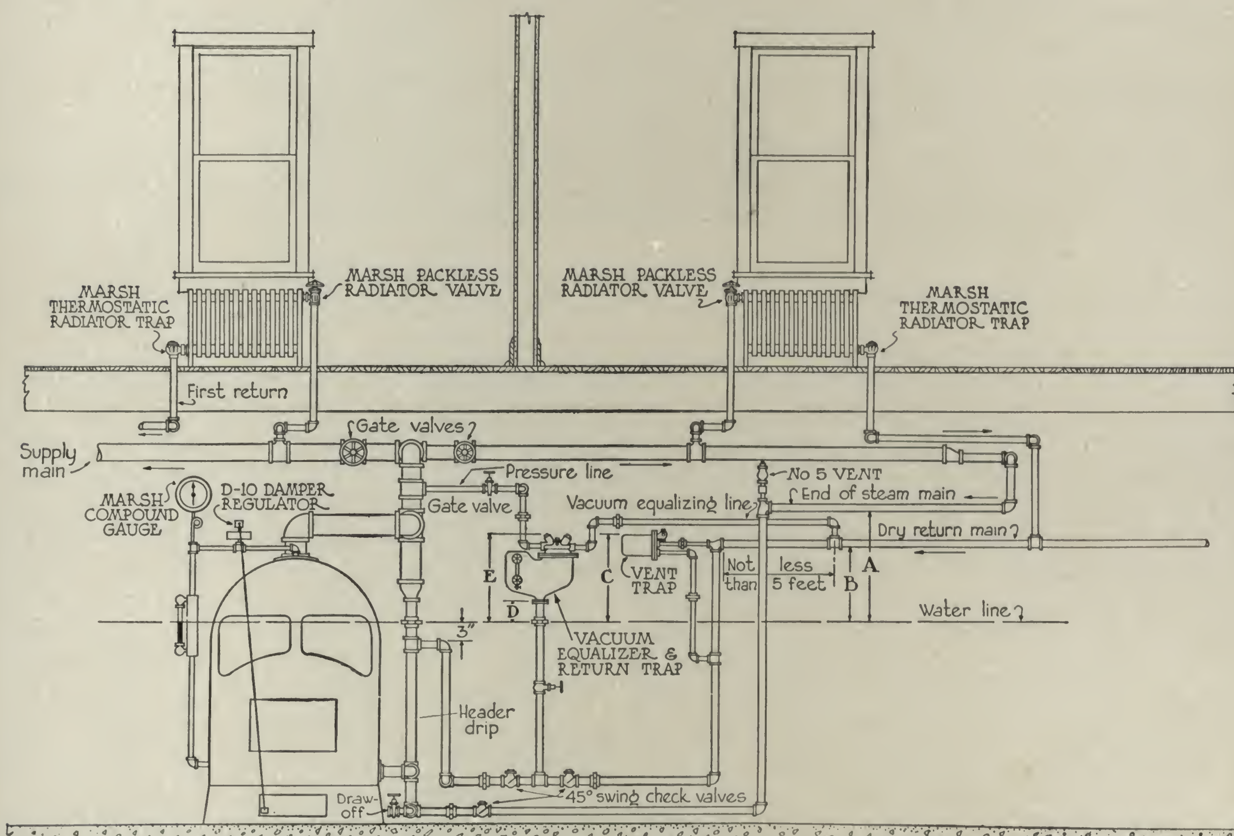
Showing Customary Arrangement of Marsh System Units


Marsh System Unit Radiator Valve

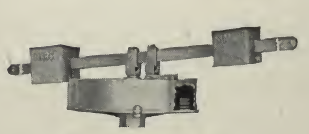

Marsh System Unit Radiator Trap



Compound Gauge

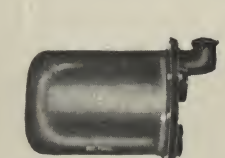


Note: Vacuum equalizer feature of return trap copyrighted.


Damper Regulator


No. 5 Vent


Marsh System Unit Equalizer and Return Trap


Marsh System Unit Vent Trap

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Operation

The Marsh Vapor System of Heating properly installed offers the opportunity to heat as heat is required. In general, this type of system embraces a generating unit or boiler with a simple arrangement of supply and return piping as the means of distributing vapors to the radiator and returning condensate to the boiler.

The cycle of operation begins with the generation of vapors in the boiler at pressures ranging from a few ounces to one-pound gauge, varied according to weather requirements. As vapor is generated it circulates through the supply piping due to its expansion, forcing the air present in the supply piping before it. By means of branches taken from the supply mains connecting to the radiator, vapor enters the radiator to serve as the heat medium. Marsh System Unit Radiator Valves, generally of the graduated type are placed at the top of the radiators and connected to the branches and serve as a means of controlling the amount of vapor which must enter the radiator to give a required amount of heat. The air contained within the radiator is forced out through the Marsh System Unit Radiator Trap and on into the return piping. As the air is eliminated into the return system the space taken up by it is instantly filled with vapor, and until such time as the vapor comes in contact with the thermostatic element in the radiator trap this element will remain in a neutral position. The radiator trap, having an expansible diaphragm, will close off immediately when it comes in contact with vapor, thereby eliminating the waste of steam into the return system.

Previous to its closing, the trap allows immediate passage of all water of condensation and air into the return system which is pitched in such a manner that the water and air will gravitate back to a point near the boiler. At this point instead of allowing the air to accumulate, it is eliminated into atmosphere through the Marsh System Unit Air Vent Trap, which is provided with an integral ball check so that the air once eliminated cannot return into the system. Likewise on the supply system, the air is eliminated by means of the Marsh No. 5 Vent, permitting a rapid circulation of vapor throughout the supply system.

At the terminus of the return main it drops down below the water line of the boiler and is connected to the boiler through a loop connection. As there is a slight pressure in the boiler the water in the return main may not have sufficient dynamic weight to flow back into the boiler by gravity, therefore some means must be provided to return this water into the boiler. To meet this condition, the Marsh System Unit No. 10 Equalizer and Boiler Return Trap is installed between the boiler and the point where the return main drops below the water line of the boiler, having a check valve on each side of the connection to the equalizer and return trap in the wet return main. Water in the return system, seeking its own level, will find its way into the body of the equalizer and return trap, and as it continues to accumulate in the latter it causes the float in this trap to rise until a predetermined point has been reached.

At this point, the float will have risen to such an extent so as to cause the mechanism within the trap to open an inlet port connected directly to the boiler by means of piping to the boiler header. This action of the return trap permits the steam pressure from within the boiler to pass on through the piping into the trap, thus equalizing the difference in pressure between the trap and boiler, and as the pressures are now the same, the water has sufficient force due to its height above the level of the water line to gravitate into the boiler—the source from which it started in the form of steam.

This cycle of operation positively returns water of condensation back into the boiler automatically, regardless of the pressure in the boiler.

In connection with this type of system, it occurs that when the fire in the boiler is banked a vacuum will be created in the supply system due to the fact that the space formerly occupied by vapor under pressure is void. This condition oftentimes causes water in the return mains to be held up in the system, thus preventing it from returning to the boiler.

This condition cannot occur in the Marsh Vapor System due to the special patented construction of the Marsh System Unit No. 10 Equalizer and Return Trap. Incorporated in the construction of this system unit is an integral ball check between the steam supply connection and the exhaust connection to the dry return main. With this arrangement the vacuum in the boiler or supply system, if it is deeper than the vacuum in the return, will lift the ball in the check valve allowing an equalization of the vacuum between supply and return systems. This frees the water in the return system allowing it to gravitate into the No. 10 equalizer and boiler return trap in the regular manner.

The boiler is equipped with a sensitive type D10 damper regulator, the purpose of which is to control the amount of vapor generated in accordance with adjustment based on the demands of outside weather conditions.

It operates automatically through a sensitive laminated metal bellows which actuates a lever arm balanced by weights. This arm through the medium of a chain opens and closes the check and draft dampers on the boiler as there is need to accelerate or retard the fire.

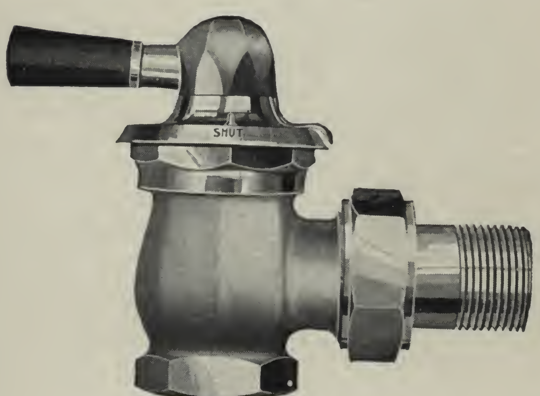
Continued on next page

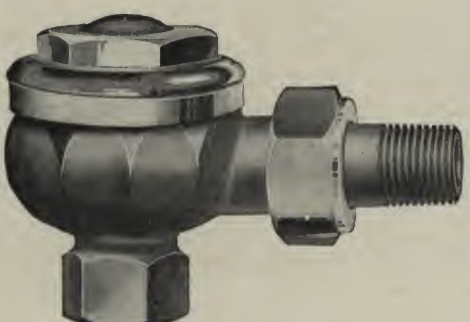
Marsh System Units

The following pages carry portrayal of the Marsh System Units which combine to form the Marsh Vapor System of Heating. Into the development and construction of these units has been incorporated the benefit of our 65 years of experience in the manufacture of heating specialties and instruments.

Many of the units here portrayed permit of vastly improved methods of heating system construction and operation, contributing to the value of this system of heating for small structures.

Beauty is featured in these units of modern design and principle.





Marsh System Unit Radiator Valve

This unit, the Marsh Radiator Supply Valve, functions to control the operation and heat output of the individual radiator. As supplied in the illustrated graduated pattern the valve can be operated to restrict the flow of steam and as a result the heat output of the individual radiator as required. Also to shut off valve or to open full.

The octagonal body lines of the Marsh System Unit Radiator Valve blend perfectly with the body lines found in the modern tubular radiator, and as installed on the radiator in combination with the Marsh System Unit Radiator Trap, has a decided effect upon the appearance of the radiator as a whole. In direct contrast with surrounding interior decorations, the Marsh System Unit Radiator Valve stands out in pleasing relief in a two-tone chrome or nickel finish; the body in satin chrome and the bonnet and tailpiece in polished finish. A handle of futuristic design crowns the Marsh Radiator Valve, lending itself to easy opening or closing of the valve.

The interior construction of this valve is unique, utilizing two monel metal discs and two stainless steel discs as the packless feature, which makes possible the elimination of the conventional spring, composition packing glands, bellows or multiple diaphragms found in most radiator valves today.

Data on valve extensions and other accessories are given in Bulletin No. 150.

Marsh System Unit Radiator Trap

These traps, through their thermostatic action, retain the steam in the radiator until it has given up its heat and finally condenses into water. They also eliminate air and water from a radiator without passing steam—a very important factor in a vacuum system.

The action of the trap is entirely automatic. It is operated by heat and continues to function as long as steam flows to the radiator.

The operating element is a phosphor bronze diaphragm containing a combination of volatile fluids which expand and contract with heat, opening and closing the valve needle.

The body is of cast steam brass with two-tone satin and polished nickel or chrome finish.

Marsh System Unit Radiator Traps are built along octagonal body lines to blend with the Marsh System Unit Radiator Valve in perfect harmony with modern tubular radiation. This unit fits into a perfect blend with surrounding interior decorating schemes.

Marsh Thermostatic Traps are made in two sizes and types indicated by Series No. 1 and No. 2. They are used according to the size of the radiator, and operate automatically from below atmosphere to 25 pounds steam pressure.

Additional data on construction and types is given in Bulletin No. 175.

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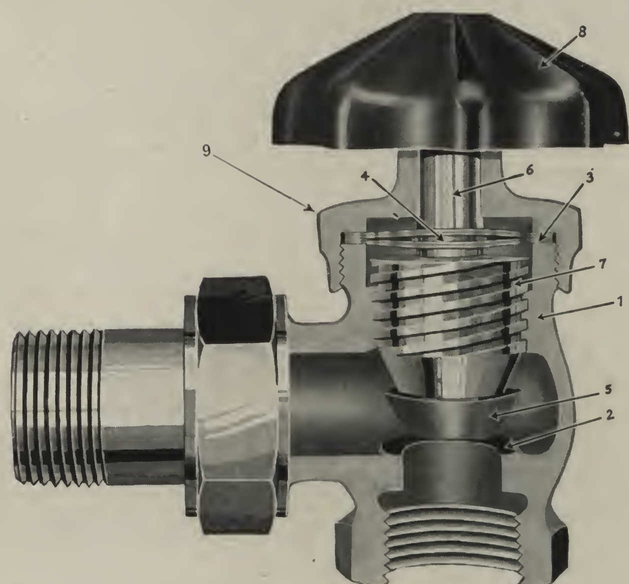
View Showing Interior and Construction of the Marsh System Unit Packless Radiator Valve



1—Valve Body

2—Valve Seat

3—Metalflex Sealing Discs

4—Stem Collar

5—Flexcone Valve Disc

6—Valve Stem

7—Thrust Screw

8—Bakelite Handle

9—Valve Bonnet

View Showing Interior and Construction of the Marsh System Unit Radiator Trap

1—Trap Bonnet

2—Trap Body

3—Thermostatic Diaphragm

4—Diaphragm Reinforcement

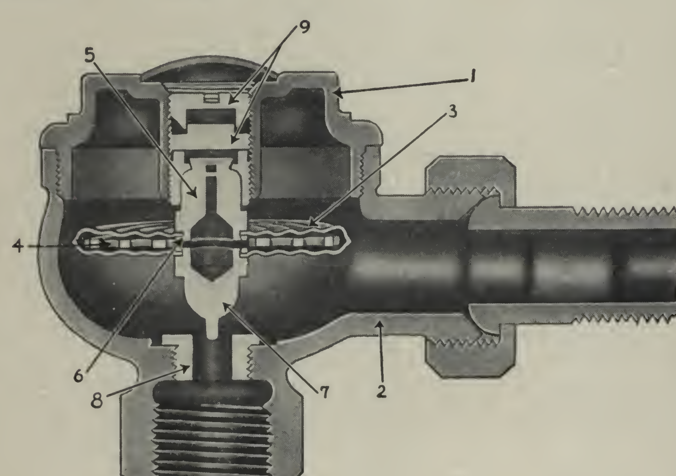
5—Swivel and Adjustment

6—Diaphragm Locking Seal

7—Valve Needle

8—Removable Seat

9—Adjustment Seal



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Marsh System Unit Equalizer and Boiler Return Trap

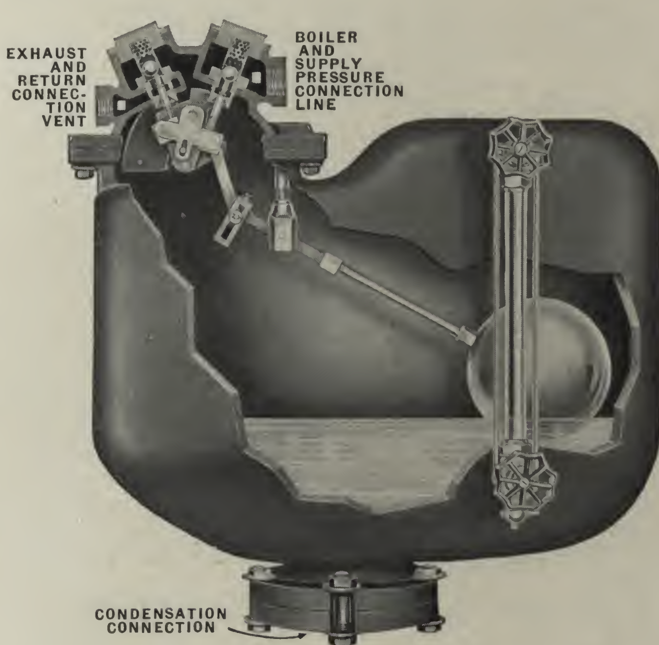
The Marsh System Unit No. 10 Equalizer and Boiler Return Trap is the most important automatic element entering into the construction of a Marsh Vapor System of Heating. The entire successful operation of the system depends upon the functions of this Marsh System Unit of assuring perfect circulation throughout the entire heating system and return of water to the boiler.

The patented features of construction embodied in this Marsh System Unit combined with perfection and accuracy of construction are entire assurance of the successful functioning of same.

Equalizer Operation

Incorporated in the head construction of the unit is an integral ball check between the steam supply and return connections as shown on the drawing. With this arrangement, should the depth of vacuum in the supply system become greater than within the return system, the integral ball check will open permitting equalization of the vacuum in the supply and return systems.

This unique and patented construction eliminates the additional piping necessitated in other types of systems where an equalizer has been installed. It likewise relieves the Marsh System of one of the most troublesome features of other vapor systems using the equalizer line—that of the small check valve placed in the line, which often either leak, destroying circulation, or stick entirely.



The Marsh System Unit Equalizer and Boiler Return Trap may be aptly termed "heart of the Marsh Vapor System" for in this device is appropriately vested the important function of assuring perfect circulation within the system at all times and under all conditions

Return of Water to Boiler

Water in the return system seeking its own level will find its way into the body of the trap, and as it continues to accumulate in the return lines, it causes the float to rise until a predetermined point has been reached.

At this point, the float will have risen to such an extent so as to cause the mechanism within the trap to open an inlet port connected directly to the boiler by means of piping to the boiler header. This action of the return trap permits the steam pressure from within the boiler to pass on through the piping into the trap, thus equalizing the difference in pressure between the trap and boiler, and as the pressures are now the same, the water has sufficient force due to its height above the level of the water line to gravitate into the boiler—the source from which it started in the form of steam.

Such a cycle of operation protects the boiler against damage by positively returning water of condensation back into the boiler automatically, regardless of the pressure in the boiler.

The mechanism within the return trap operates as follows: The float and float rod are pivoted to a supporting stem attached to the head of the trap, allowing a free motion. As water accumulates in the trap, the float rises accordingly. When a predetermined height of water has been reached, the connecting rod, which is pivoted to both float rod and main balance weight, pulls the main balance weight in an off-center position, causing it to fall downwardly.

Simultaneously, the falling of the main balance weight acts upon an idler weight also throwing this weight off center in a downward motion, which actuates a cam placed in an eccentric position on the idler weight in such a manner as to force the boiler pressure inlet valve stem upwardly.

This unseats the ball and allows steam from the boiler to enter into the trap and in the same motion, pulls the exhaust vent valve stem downward, closing it tightly against the escape of steam. After reaching the tripping point it requires but a second to complete the cycle of opening the boiler pressure inlet valve and closing the exhaust vent valve.

As the pressures in the boiler now correspond to that of the trap, the water will flow into the boiler

Continued on next page

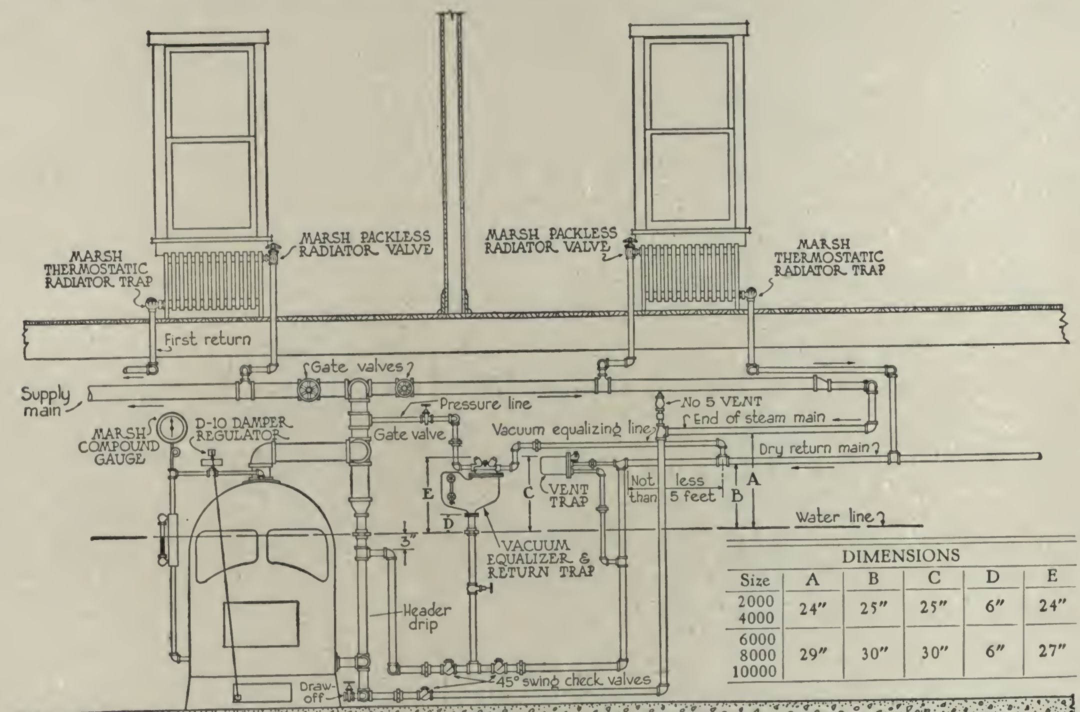
to maintain a normal water line. As the water recedes, the float follows the downward motion and reverses the action of the weights. This closes the boiler pressure inlet valve and opens the exhaust vent valve, which allows the small amount of steam accumulated in the trap to be vented. This action within the trap continues as long as the system is in operation. It is noiseless, entirely automatic and unfailing in its performance.

Construction

The body is of heavy cast iron fitted with a companion flange which bolts on the inlet opening. The head is so designed that when it is removed from the body, the entire mechanism can be taken out in one operation. The float is of heavy copper. The cast brass float and connecting rods are pivoted with stainless steel pins to resist rusting or wearing action.

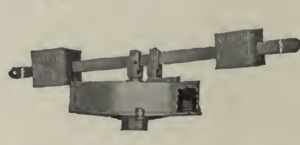
The main balance and idler weights are made of cast iron, mounted on the body of the trap by stainless steel pins with bronze bushings, and the valve stems, eccentric and idler blocks are made of brass.

The entire assembly is well protected against wear from operation or by rust from the water.



DIMENSIONS					
Size	A	B	C	D	E
2000 4000	24″	25″	25″	6″	24″
6000 8000 10000	29″	30″	30″	6″	27″

Detail Drawing of Marsh Vapor System Showing Sizes of System and Correct Location of Marsh System Units

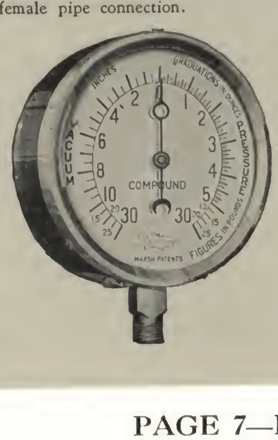


Type D-10 Damper Regulator

The boiler on this system is equipped with this sensitive regulator—the purpose of which is to control the amount of vapor generated in accordance with adjustment based on outside weather conditions. It operates automatically through a sensitive laminated metal bellows which actuates a lever arm balanced by weights. This arm through the medium of a chain opens and closes check and draft dampers on the boiler. This regulator comes equipped with 48-inch lever weight, two bell cranks, 12 feet of chain and 1-inch female pipe connection.

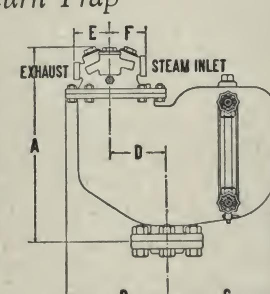
No. 83 Compound Retard Gauge

The Marsh No. 83 Compound Retard Gauge was designed expressly for vapor systems. Dial is graduated in ounces up to 5 pounds, and in 5-pound graduations from 5 to 30 pounds. For sub-atmospheric pressures, the depth of vacuum is indicated in wide half-inch graduations up to 10 inches, and in 5-inch graduations from 10 to 30 inches. Sizes 3½-inch to 10-inch dial.



Sizes and Dimensions of Marsh Equalizer and Boiler Return Trap

For installations having more than 10,000 square feet of direct radiation, two or more Marsh System Unit Equalizer and Boiler Return Traps can be connected in series, details for which will be furnished upon request.



No.	Size	A	B	C	D	E	F
10-A 10-B	2000 4000	16¾″	8¼″	9⅜″	4⅝″	3″	3″

Steam inlet ¾″. Trap inlet 2″. Exhaust ½″.

		A	B	C	D	E	F
10-C 10-D 10-E	6000 8000 10000	21½″	9¾″	11¼″	5⅜″	3⅜″	3⅜″

Steam inlet ¾″. Trap inlet 2½″. Exhaust ½″.

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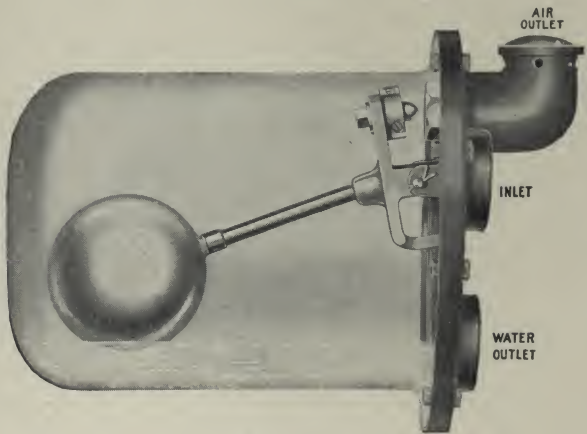


The Marsh System Unit No. 11 Air Vent Trap

Function

This trap is designed to provide a positive means of expelling air at the terminus of the return system in the boiler room and at the same time prevent leakage.

Operation

A float mechanism within the trap allows the air to pass from the top of the return line into this trap, and then to escape through the air outlet at the top of the trap by means of piping, which extends well above the normal water level of the return system.

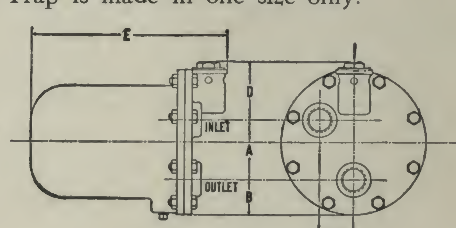
The ball check valve prevents the air from re-entering the system at this point. As water builds up in this trap, the float rises, closing the air outlet and retaining the water in the return system.

Capacity

This trap has sufficient air expelling capacity to take care of all size jobs up to 10,000 square feet direct radiation. On larger installations where more than one Marsh System Unit No. 10 Equalizer and Boiler Return Trap are used, one No. 11 Air Trap is installed for each.

Construction

The body is of pressed steel with a cast iron cover. The float mechanism is made of non-corrosive metals and the air outlet fitted with a special Jenkins composition disc to insure a tight seating. The Trap is made in one size only.



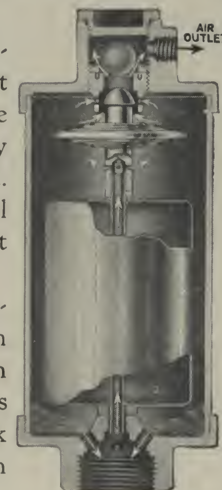
DIMENSIONS IN INCHES

Air outlet	Inlet	Water outlet	A	B	C	D	E
½ inch	1 inch	1 inch	3 7/16″	1¾″	1⅞″	3⅛″	10½″

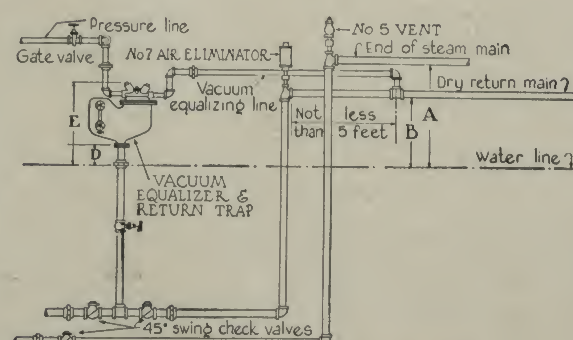
Marsh No. 7 Air Eliminator

This air eliminator is another form of air expelling unit used for the same purpose as the No. 11 Air Vent Trap. It may be substituted where so desired. It is equipped with cylindrical float arrangement to prevent water from surging.

The air port allows free expulsion of air, and has a vacuum top feature to prevent air from re-entering the system. This eliminates the need for a check valve on the air outlet. Made in ¾ and 1 inch connections.



No. 7 Air Eliminator

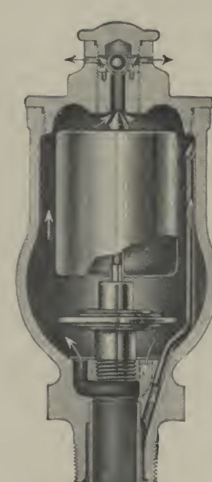


Application of No. 7 Air Eliminator

Marsh No. 5 Vent

On vapor systems this vent is the air expelling unit at the ends of steam mains. It expels air until steam has reached the thermostatic element. When steam reaches this element, it expands upwardly, closing the outlet port and preventing vapor from escaping.

This vent is fitted with a float to eliminate the possibilities of water surging and also a vacuum top feature to prevent air from re-entering the system.



No. 5 Vent

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Marsh System Unit Drip Traps

Marsh No. 8 Drip Trap

This trap is continuous in discharge and is designed to quickly remove condensation and air from drip points on steam mains, steam risers, steam coils, or blast heaters, or for any like service within the capacity of the trap.

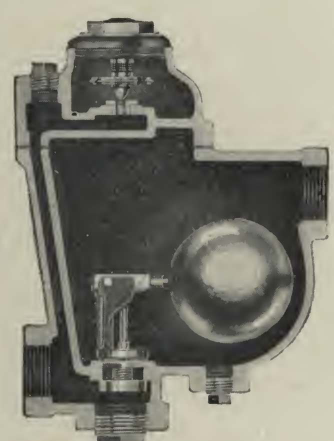
The design permits a deep water seal on the discharge valve. This water discharge valve is float controlled and located at a low point in the bottom of the trap and air is removed through a thermostatically controlled port in the cap of the trap. The thermostatic member used is our standard assembly as in the No. 1 Marsh Radiator Trap. Normally air is discharged through a port directly to the outlet connections of the trap. In cases where the trap may be required to discharge to a wet return the air discharge may be connected to a dry return from a special opening tapped in the cap of the trap.

Body of trap is provided with one 1¼-inch tapped inlet and two 1¼-inch tapped outlet openings. These openings are located so as to permit direct connection both to inlet and from outlet.

The trap may be suspended directly in the piping and no other supports are necessary. The thermostatic element screws directly in the cap of the trap and is interchangeable with the element from the No. 1 Radiator Trap.

All interior parts are of forged bronze castings with the exception of the float which is a seamless copper float tested for a working pressure of 25 pounds per square inch.

Copper asbestos gaskets are used throughout which avoid the necessity of supplying new gaskets whenever trap may be opened for inspection or repair.



No. 8 Drip Trap

CONNECTION SIZES

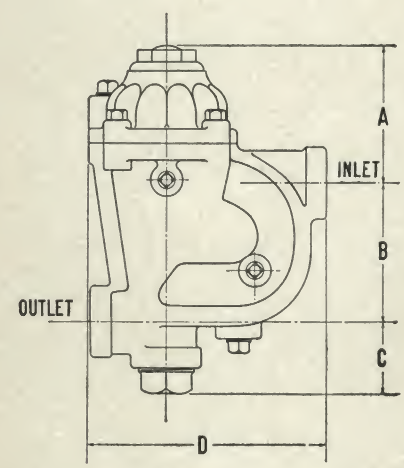
1¼-in. Inlet
1¼-in. Outlet

DIMENSIONS

A—4⅜ in.
B—4⅛ in.
C—2¼ in.
D—7 11/16 in.

CAPACITIES

Steam pressure in lb.	Capacities in lb. water per hr.
½	500
1	900
2	1400
3	1600
4	1800
5	2000
10	3200
15	4000



Marsh No. 12 Drip Trap

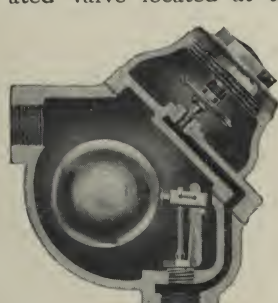
Designed for removal of air and condensation from short steam mains, branches or riser. Unit heaters, steam coils, etc., are within the limits of the capacity of the trap.

The size and weight of the trap permits its installation in the piping without any other means of support.

Condensation is removed through a float operated valve located at the lowest point inside the trap body. Air removal is located in the cap of the trap. Air passes through a passageway and out through the trap outlet.

Body of trap is of cast iron and all interior parts are of forged steam bronze, copper and monel metal.

The thermostatic member of the air by-pass is interchangeable with the member of the standard No. 1 Radiator Trap.



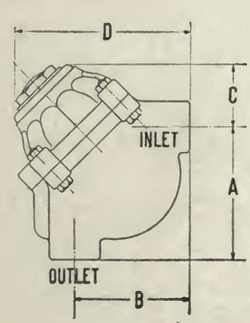
No. 12 Drip Trap

CONNECTION SIZES

¾-in. Inlet
¾-in. Outlet

DIMENSIONS

A—4½ in.
B—3⅞ in.
C—1⅞ in.
D—6 in.



CAPACITIES

Steam pressure in lb.	Capacities in lb. water per hr.
½	350
1	600
2	800
3	1200
4	1400
5	1600
10	2000
15	2800

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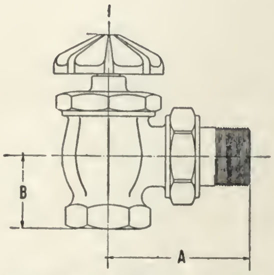
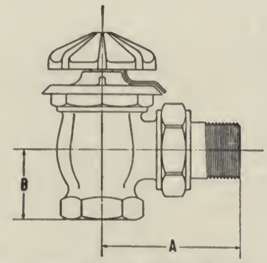
Patterns and Roughing-in Dimensions of Marsh System Unit Packless Radiator Valves



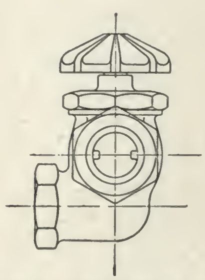
No. 100-A (Wheel Angle)

DIMENSIONS IN INCHES

Sizes	A	B
1/2"	2 3/8"	1 3/16"
3/4"	2 7/8"	1 3/16"
1 "	3 1/8"	1 9/16"
1 1/4"	3 5/8"	1 3/4"
1 1/2"	3 7/8"	1 1/2"
2 "	4 3/8"	2 3/8"



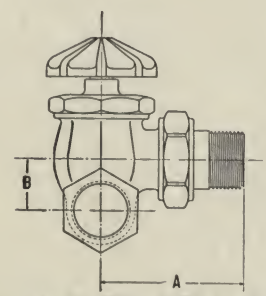
No. 101-A (Wheel Angle—Graduated)



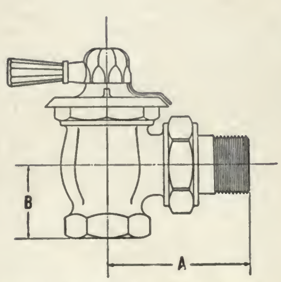
No. 100-L (Wheel Left Hand Corner)

DIMENSIONS IN INCHES

Sizes	A	B
1/2"	2 3/8"	3/4"
3/4"	2 7/8"	27/32"
1 "	3 1/8"	7/8"
1 1/4"	3 5/8"	1 1/8"
1 1/2"	3 7/8"	1 1/4"
2 "	4 3/8"	1 1/2"



No. 100-R (Wheel Right Hand Corner)



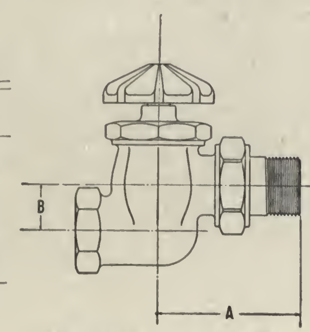
No. 102-A (Lever Handle)

DIMENSIONS IN INCHES

Sizes	A	B
1/2"	2 3/8"	1 3/16"
3/4"	2 7/8"	1 3/16"
1 "	3 1/8"	1 9/16"
1 1/4"	3 5/8"	1 3/4"
1 1/2"	3 7/8"	1 1/2"
2 "	4 3/8"	2 3/8"

DIMENSIONS IN INCHES

Sizes	A	B
1/2"	1 3/8"	2 3/8"
3/4"	1 3/8"	2 7/8"
1 "	1 11/16"	3 1/8"
1 1/4"	2 "	3 5/8"
1 1/2"	2 3/8"	3 7/8"
2 "	3 1/16"	4 3/8"



No. 100-B (Back Offset)

Explanation of Dimensional Tables

Type No. 101 (wheel handle) and Type No. 102 (lever handle) graduated valves as made in left hand corner pattern, right hand corner pattern and back offset pattern have the same roughing-in dimensions shown above for the Type 100 valves in these patterns.

Roughing-in dimensions for Type Nos. 103 Lock and Shield Packless Valve and 104 Lock and Shield Graduated Valves in all patterns are the same as Type No. 100.

TYPES AND PATTERNS OF MARSH SYSTEM UNIT RADIATOR VALVES

Type	Pattern	Symbol	Type	Pattern	Symbol
Wheel Handle	Angle	100-A	Lever Handle Graduated	Angle	102-A
Wheel Handle	Left Hand Corner	100-L	Lever Handle Graduated	Left Hand Corner	102-L
Wheel Handle	Right Hand Corner	100-R	Lever Handle Graduated	Right Hand Corner	102-R
Wheel Handle	Back Offset	100-B	Lever Handle Graduated	Back Offset	102-B
Wheel Handle Graduated	Angle	101-A	Lock and Shield	Angle	103-A
Wheel Handle Graduated	Left Hand Corner	101-L	Lock and Shield	Left Hand Corner	103-L
Wheel Handle Graduated	Right Hand Corner	101-R	Lock and Shield	Right Hand Corner	103-R
Wheel Handle Graduated	Back Offset	101-B	Lock and Shield	Back Offset	103-B

Note: Lock and shield construction can also be supplied in the graduated type valve—specified as No. 104—in any pattern listed above.

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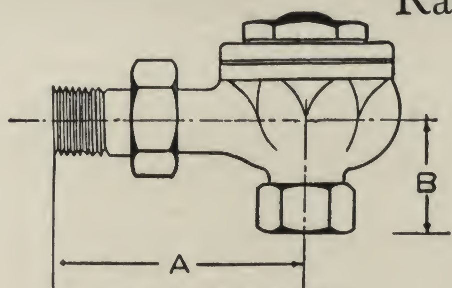
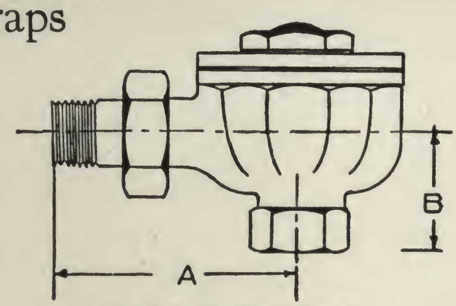
Roughing-in Dimensions of Marsh System Unit Radiator Traps



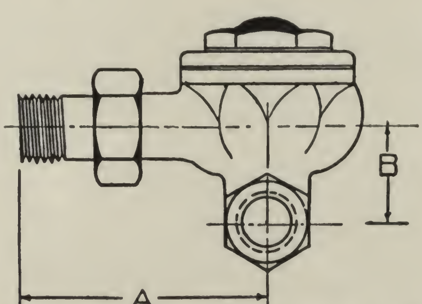
No. 1-A (Angle Pattern)

Size	Capacity	Water	A	B
½″	150 sq. ft.	40 lbs. per hour	3¼″	1½″



No. 2-A (Angle Pattern)

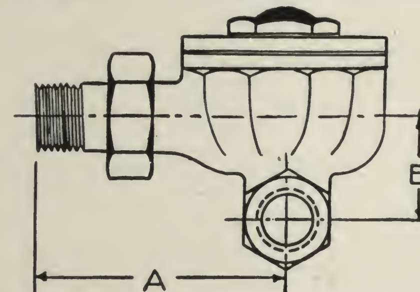
Size	Capacity	Water	A	B
½″	200 sq. ft.	50 lbs. per hour	3½″	1$\frac{7}{16}$″
¾″	500 sq. ft.	125 lbs. per hour	3$\frac{15}{16}$″	2 ″
1 ″	1000 sq. ft.	250 lbs. per hour	4⅜″	2$\frac{1}{16}$″



No. 1-R (Right Hand) and No. 1-L (Left Hand Corner Pattern)

Size	Capacity	Water	A	B
½″	150 sq. ft.	40 lbs. per hour	3¼″	1¼″

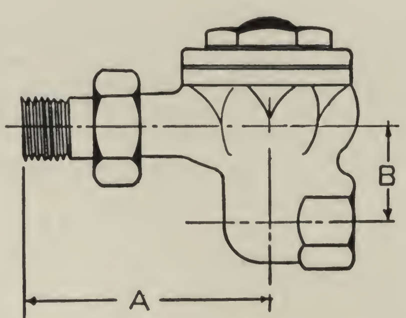
Dimensions on right and left hand pattern are identical.



No. 2-R (Right Hand) and No. 2-L (Left Hand Corner Pattern)

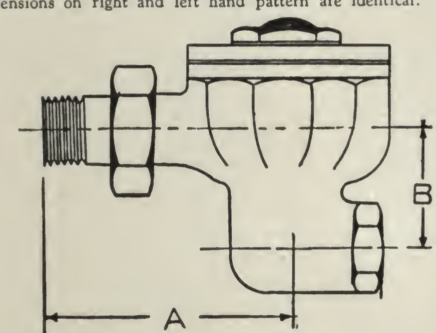
Size	Capacity	Water	A	B
½″	200 sq. ft.	50 lbs. per hour	3¾″	1¼″
¾″	500 sq. ft.	125 lbs. per hour	3$\frac{15}{16}$″	1⅝″
1 ″	1000 sq. ft.	250 lbs. per hour	4$\frac{5}{16}$″	1⅞″

Dimensions on right and left hand pattern are identical.



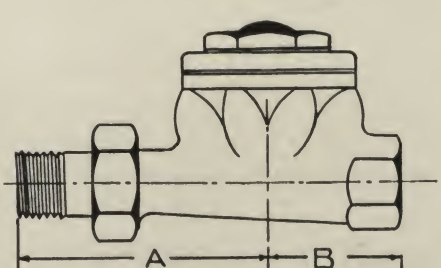
No. 1-B (Back Offset Pattern)

Size	Capacity	Water	A	B	C
½″	150 sq. ft.	40 lbs. per hour	3¼″	1¼″	1⅛″



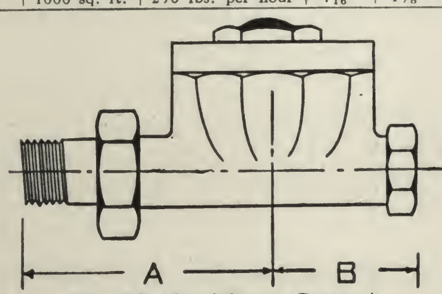
No. 2-B (Back Offset Pattern)

Size	Capacity	Water	A	B	C
½″	200 sq. ft.	50 lbs. per hour	3⅞″	1¼″	1⅜″
¾″	500 sq. ft.	125 lbs. per hour	3$\frac{15}{16}$″	1⅝″	1$\frac{9}{16}$″
1 ″	1000 sq. ft.	250 lbs. per hour	4$\frac{5}{16}$″	1⅞″	1⅝″



No. 1-S (Straightway Pattern)

Size	Capacity	Water	A	B
½″	150 sq. ft.	40 lbs. per hour	3¼″	1¾″



No. 2-S (Straightway Pattern)

Size	Capacity	Water	A	B
½″	200 sq. ft.	50 lbs. per hour	3¾″	2″

Continued on next page

Typical Specifications for Marsh Vapor Systems

1. General Conditions—The general conditions governing this portion of the work shall be in accordance with those of the American Institute of Architects and installation shall be in accordance with the standard practices of the local association of contractors.

2. Scope of Work—The work to be done includes the furnishing of all labor and materials for the complete erection of a Marsh Vapor Heating System as hereinafter specified and as shown on drawings. Work to be done shall be executed in a neat and workmanlike manner, and all heating apparatus pertaining to this portion of the work to be of the best grade materials and shall strictly conform to these specifications.

3. Boiler—Furnish and install a .... type boiler as manufactured by ...., having a guaranteed rating of .... sq. ft. of radiation. Boiler shall be equipped with all necessary trimmings and accessories, including Marsh Compound Vacuum and Pressure Gauge, Kunkle Pop Safety Valve and Type D-10 Damper Regulator. The above boiler shall be connected to chimney with a .... in. breeching of .... gauge black steel, all as shown on plans.

4. Pipe and Fittings—Contractor shall furnish and install where indicated on plans all pipe and fittings properly supported and graded to insure a complete and successful operation of the system. Fittings to be of standard best grade cast iron, and pipe to be of mild black steel properly threaded and reamed. Joints to be made up with a paste consisting of Portland cement and boiled linseed oil applied to male threads only. Proper provision to be made for expansion in all mains, risers and branches.

Boiler header shall be made up of standard flanged fittings connected to boiler full size of steam opening, same to be dripped to return header through a bleeder. All spring pieces to steam and return mains shall be taken out of top of mains at 45 deg. on upfeed, and out of bottom of steam mains at 45 deg. on downfeed systems. All runouts or branches to radiators or risers to be graded 1 in. in 10 ft. and supply and return mains 1 in. in 20 ft.

Short run steam mains shall be returned back to boiler at a height not less than 24 in. above water line, dropping to return header with check valve and vented through a Marsh No. 5 Vent. Mains that terminate a great distance from boiler shall be dripped through a Marsh No. .... trap and vented by a Marsh No. 5 Vent. Return mains shall run in same direction as steam mains and shall terminate at the boiler at a height not less than .... in. above water line.

5. Covering—All steam mains, risers and runouts that are exposed shall be covered with an approved air cell covering 1 in. thick, same to be convased and banded in a neat and workmanlike manner. Fittings to be covered with plastic asbestos cement troweled smooth and canvased. System shall be tested with water for leaks before covering of piping is commenced.

6. Floor Plates—Where pipes project through finished floor, ceiling or wall, provide an approved type nickel plated floor or ceiling plate.

7. Radiator—Furnish and install where shown on plans a total of .... sq. ft. of direct radiation, as manufactured by .... or equal, to have top supply and bottom return tappings at opposite ends. Contractor must instruct manufacturer to thoroughly wash sections free of all core sand and plug all openings. Eccentric bushings shall be used at return tapping.

8. Painting—All radiation and exposed piping shall be given one priming coat of flat paint and one coat of paint to match surrounding decorations, except where piping is to be covered, all as directed by the architect. Boiler and smoke breeching to be given two coats of graphite paint.

9. Radiator Traps—Each radiator shall be provided with a Marsh System Unit Radiator Trap of proper size as manufactured by JAS. P. MARSH & COMPANY.

TAPPING SCHEDULE

Sq. ft.	Valve	Trap
0– 30	½"	½" No. 1
31– 80	¾"	½" No. 1
81–125	1 "	½" No. 1
126–175	1¼"	½" No. 2
176–250	1½"	½" No. 2
250 up	2 "	¾" No. 2

10. Radiator Valves—Each radiator shall be equipped with a Jas. P. Marsh & Company System Unit Flexcone Radiator Valve of proper size:

11. Vapor Specialties—At each point where steam mains drop to a lower level or where a steam main is dripped, it shall be vented by a Marsh No. 5 Vent. Where the return main drops below water line at boiler, it shall be vented by a Marsh No. 11 Air Trap as indicated on drawings. Return main shall be connected to a Marsh Equalizer and Boiler Return Trap, having a capacity of .... sq. ft. of direct radiation. Install swing check valves on each side of return trap connection in return main and connect same to boiler header bleeder through Hartford loop connection 3 in. below water line of boiler. All check valves to be tested for tightness before installing.

12. Cleaning System—System shall be operated for a period of several days with condensation wasted to sewer. Boiler shall then be blowed down through the bottom blowoff connection under 5-lb. pressure. Remove safety valve and connect piping from this opening to sewer properly valved. Fill boiler to proper water level, build hot fire to create at least 5 lb. pressure and open valve in top blowoff connection, feeding enough water to boiler to maintain a constant water level. After four hours firing in this manner, fill boiler with water and allow hot water to flow out of top blowoff connection for one hour. Draw the fire, shut off feed water and blow down through bottom blowoff connection. Allow boiler to cool, replace safety valve and fill boiler with fresh water to proper level.

13. Guarantee—The contractor shall guarantee in the entire system a complete continuous and noiseless circulation of steam to each radiator or coil, free of all air and condensation, at a pressure not to exceed .... lb. gauge. He shall also hold himself responsible for any defects which may develop in any part of the system, including piping, valves or other apparatus included in this specification, due to faulty workmanship, design or material at any time within one full heating season from date of final payment and shall remedy such defects at his own cost.

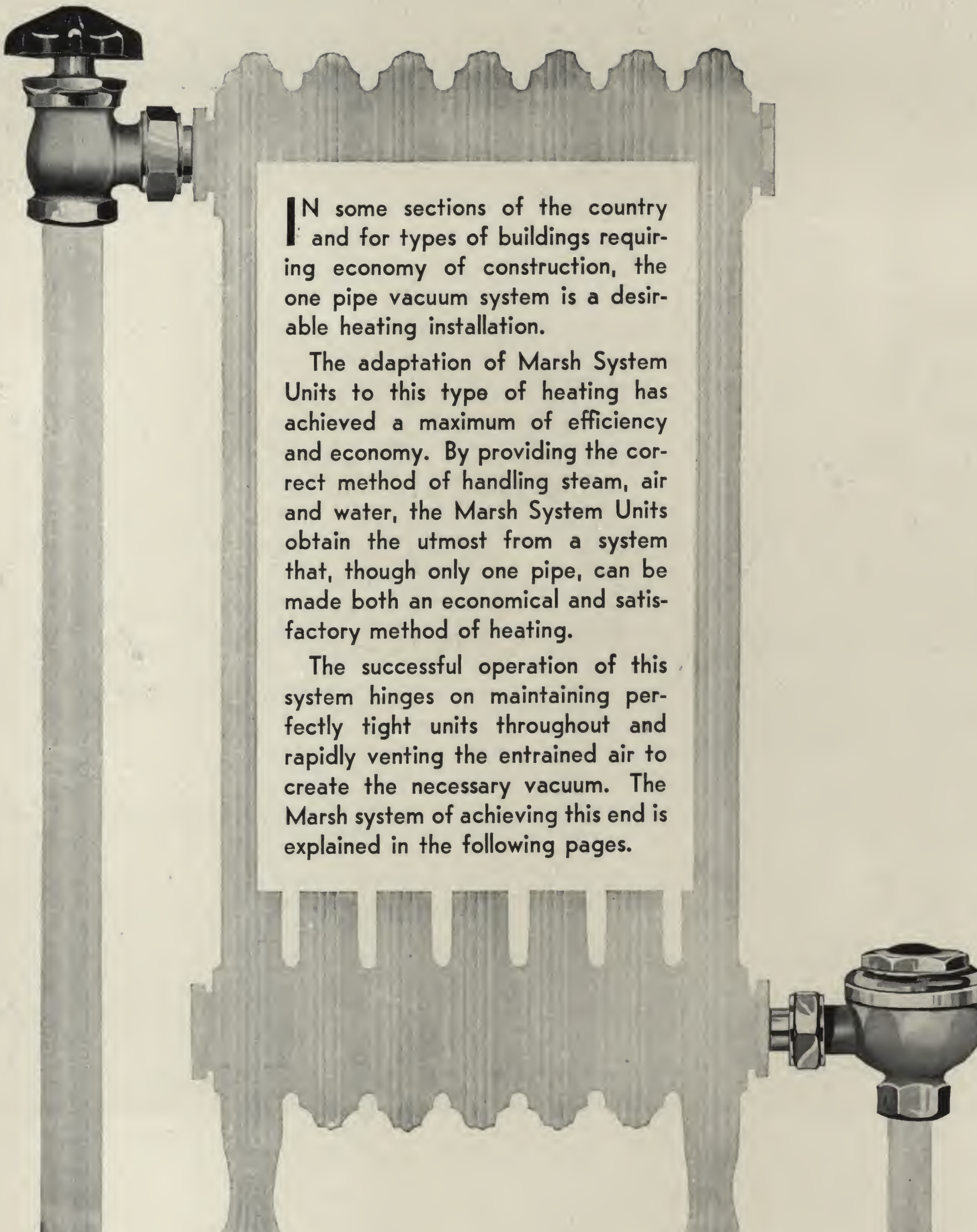
14. Finally—The true intent of these specifications is to bring about the satisfactory completion of the system as outlined above, and nothing contained herein can be construed to relieve the contractor from making good and perfect the work in all usual details of construction, and he will be held responsible and bear all expenses incidental to the satisfactory completion of the work.

THE MARSH ONE PIPE VACUUM SYSTEM OF HEATING

Bulletin No. 125

for
Residential
Small
Apartment
and
Public
Buildings

JAS. P. MARSH & COMPANY
CHICAGO



IN some sections of the country and for types of buildings requiring economy of construction, the one pipe vacuum system is a desirable heating installation.

The adaptation of Marsh System Units to this type of heating has achieved a maximum of efficiency and economy. By providing the correct method of handling steam, air and water, the Marsh System Units obtain the utmost from a system that, though only one pipe, can be made both an economical and satisfactory method of heating.

The successful operation of this system hinges on maintaining perfectly tight units throughout and rapidly venting the entrained air to create the necessary vacuum. The Marsh system of achieving this end is explained in the following pages.

THE MARSH ONE PIPE VACUUM SYSTEM OF HEATING

THE one pipe heating system is usually applied to that type of structure, in the building of which first cost is an important consideration, but in which it is desired not to sacrifice the benefits accruing from radiator steam heating.

Air and Vacuum Valve

The installation of the Marsh System Unit Air and Vacuum Valve and correlated devices on one pipe steam heating system overcomes certain weaknesses inherent in this system. This valve functions to rapidly eliminate air from the system and seal it against further intrusion of air when the steam pressure drops. It likewise keeps the system under a vacuum between heating-up periods. This permits steam to be generated and circulated under lower pressures or vacuum and the radiators retain heat for a much longer period, resulting in a considerable saving in fuel.

It also serves to eliminate noises and pounding that are usually found in one pipe systems in which proper circulation under vacuum conditions is not obtained.

The Radiator Valve

Of prime importance in this system is the use of a perfect packless supply valve which is installed at the bottom of the radiator. In the one pipe system steam and condensate travel in opposite directions in the same piping and through the same valve. This conflict of opposing elements is responsible for the noisome hammering and pounding to which one pipe heating systems are often subject. This condition is alleviated by the use of valves with large openings. Likewise, for this reason, valves on such systems must be either fully opened or fully closed. But even in the case of valves with large openings, the operation of the valve, unless performed quickly will give rise to hammering.

One of the chief causes of loss of vacuum in this type of system is the infiltration of air due to leakage around the valve stem.

The Marsh System Unit Radiator Valve is the ideal valve for the one pipe vacuum system. It is perfectly packless and immune to air infiltration or steam escape. The large port opening provides practically the same opening as the pipe itself, offering no resistance to the flow of steam or condensate. It is quick opening in operation. It opens fully, closes tightly and is operated completely by less thar a full turn.

Boiler Room Equipment

As in the case of any type of heating system, the proper functioning of the one pipe vacuum system is largely dependent upon the wise selection of the boiler and boiler equipment. A sensitive damper regulator and a gauge that responds to the slightest changes in pressure or vacuum are essential to the successful operation of the system.

In design the system is comprised of a source of steam supply. The supply main from the source of steam supply pitches downward following a course depending upon the radiators to be supplied. The pitch should not be less than ¾ inch or 1 inch in 10 feet. Depending upon the contour of the building, the mains may be carried to some distant point from the boiler before terminating or they may be arranged so that their terminus occurs at or near the boiler. In either case, the main is dropped below the water line of the boiler with a check valve at the base of the drop to prevent water from the boiler surging into the system.

Application

The Marsh System Units comprising this one pipe vacuum system of heating may not only be utilized in the installing of systems in new buildings but are readily adaptable to old one pipe systems, transforming them to vacuum operation.

Tightness of System

It is equally important that all pipe joints be perfectly tight, so that no air can penetrate the system through the joints. A system, to be sufficiently tight, should be subjected upon installation to a twofold test to determine the tightness of the joints, sealing those that show signs of leakage. A brisk fire should be built in the boiler and continued until 5 pounds is shown on the gauge and all radiators filled with steam. Then draw fire. All joints should be carefully examined for leaks. If the system is tight, after the pressure has dropped, continued condensation of the steam will create a vacuum of at least 10 inches. After reaching a maximum, the vacuum indication on the gauge will recede and if the system is tight this recession will be at a rate of less than 1 inch of vacuum per hour.

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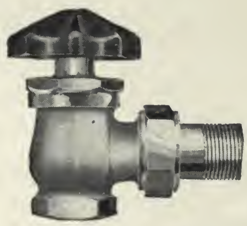
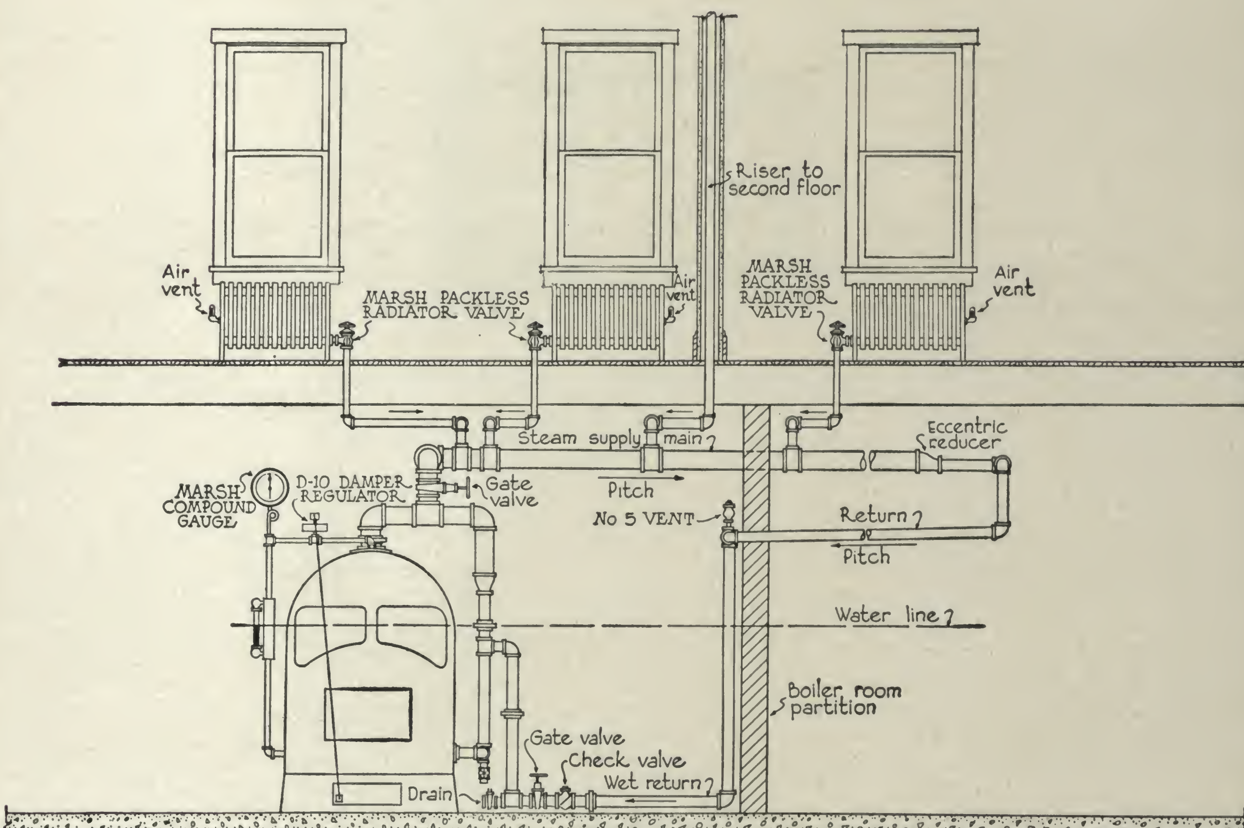
Typical Installation
Marsh One Pipe System of Heating

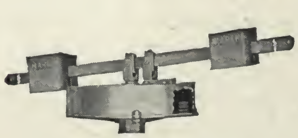
Showing Customary Arrangement of Marsh System Units



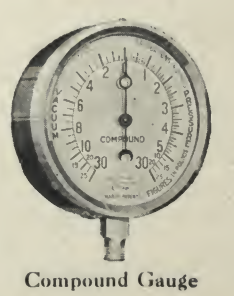
Marsh System Unit Radiator Valve

Marsh System Unit Air and Vacuum Valve





Damper Regulator



Compound Gauge

No. 5 Vent

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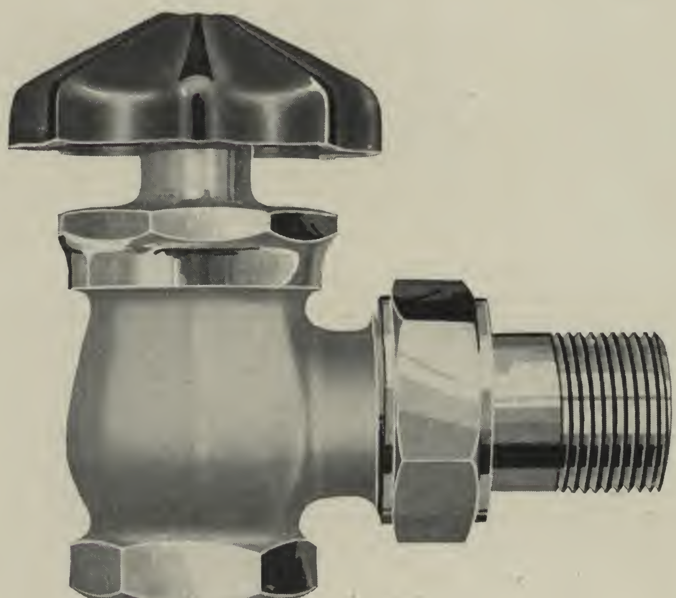
Marsh System Units

Following the trend towards beautifying interior decorations in the modern mode, Marsh has combined efficiency with beauty of line in radiator valves and air vents. The designs of these units match each other and at the same time blend with the fine lines of up-to-date tubular radiators.



Marsh System Unit Radiator Valve

The Marsh Radiator Valve is exceptionally well suited to use on the one pipe vacuum system. It has a large opening, operates rapidly, and is perfectly packless. To efficiency of operation is added beauty. The body design of this valve is in keeping with modern decoration and matches the equally modern design of the air and vacuum valve.

The valve is finished in two-tone chrome finish; the body in satin chrome and the bonnet and tail-piece in polished chrome. A Bakelite wheel handle of modern design crowns the valve and is so moulded that it fits perfectly into the hand for easy operation. The body is of the highest grade cast steam bronze. The valve seat is so designed that grit, dirt or scale will not clog it.

Bodies are regularly furnished in angle, straight-way, offset and right and left-hand corner types in sizes ranging from ½ inch to 2 inches inclusive. Data on valve extensions and other accessories are given in bulletin No. 150. Construction details are given on next page.

Marsh Air and Vacuum Valve

This radiator air vent carries out the same modern motif in design as the new Marsh Radiator Valve. The combination of this vent with its companion part, the radiator valve, makes a most pleasing appearance on the latest type of radiator.

The function of this device is to vent the air from the radiator and close the system when steam comes in contact with a special element within, thus preventing steam waste and likewise preventing the introduction of air into the system.

Water of condensation is drained as fast as formed. If the vent fills with water from any condition in the radiator, the syphon first clears the base of the vent of water. Air then rushes to the top of the vent above the water line and the balance of water falls to base and is instantly syphoned back into the radiator.

Dirt, grit or scale cannot interfere with the operation of the vent.

Finished in lustrous polished chrome.

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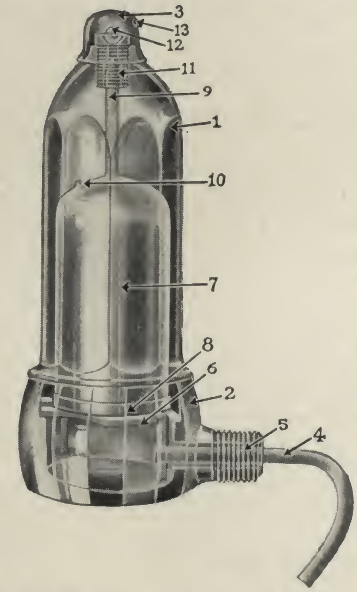
Operation of the Marsh Air and Vacuum Valve



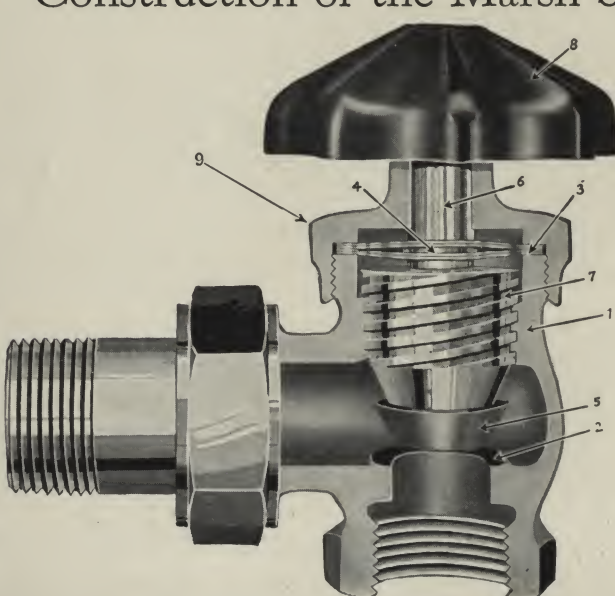
The operation of the Marsh Air and Vacuum Valve is based upon a new principle of construction, which combines the three important functions of thermostatic, flotation and vacuum operation in one operative part. It has very rapid air eliminating capacity and an absolutely positive vacuum feature. With the exception of the primary vacuum at the initial firing up, the vacuum operation of the Marsh Air and Vacuum Valve is controlled by the sealing of atmospheric pressure within the float member.

The entire mechanism of the Marsh Air and Vacuum Valve is contained within the assembly of the shell (1) and the base (2), except the primary ball check (12) which is contained in the cap (3).

Operation is as follows: When steam enters the radiator it drives air ahead into the valve, through the vent screw (11), (pushing the light ball upward) and out through the air port (13). It takes only a fraction of an ounce of pressure to remove it from its seat. When all air has been eliminated steam enters the valve and a combination of volatile fluids contained within the float member (7) creates internal pressure expanding diaphragm (8) which rests upon baffle plate (6), raising the float member (7) and valve pin (9), sealing vent screw (11).

The valve remains closed until additional air forms, when its lower temperature contracts the diaphragm (8) removing valve stem from vent screw and permitting air to escape. As the air is replaced by steam the diaphragm expands, sealing the valve once more. As the steam condenses, a vacuum is formed within the radiator and valve. This draws the primary ball (12) against its seat until such time as approximately 1 inch of vacuum is created in the radiator and the valve. With atmospheric pressure sealed into the float (7) through air seal (10) and a vacuum in the valve surrounding the float, the difference in pressure causes the diaphragm (8) to remain expanded raising the float and valve pin against the vent screw, sealing the valve. As the depth of vacuum increases the pressure on the inside of the float against the diaphragm increases, assuring a perfect seal against the entrance of air and maintaining the system under a vacuum until additional steam is supplied. Should a rush of water enter the valve from the radiator, the baffle plate (6) serves to break up the force of the water impact, protecting the float against damage. As this water enters the valve the float (7) rises, carrying the valve pin (9) against the seat, sealing the valve. Due to the inner construction of the base (2) water passes out of the valve by gravity and is aided in this course by the syphon (4), through which water can flow while steam or air enter the valve through channel (5).

Construction of the Marsh System Unit Radiator Valve



The body of the valve (1) is a steam bronze casting accurately machined and tested to 125 pounds pressure. The valve seat (2) is built integrally into the valve body and in combination with the Flexcone valve disc (5) permits a large, full capacity flow through the valve. The lift thread in which the thrust screw (7) operates is cut integrally into the main body casting allowing a large deep thread and adding strength to the body casting. The patented Flexcone valve seat (5) is a drawn monel metal spring cup permanently riveted to the thrust screw. Integrally incorporated in the valve stem is a perfectly machined stem collar (4) which in conjunction with the Metalflex sealing discs (3) serve to make the valve perfectly packless. These sealing discs consist of two sets of thin metal diaphragms. The valve bonnet (9) is screwed onto the valve body around the valve steam (6), lining up the latter and at the same time compressing the upper set of Metalflex discs against the lower set, forming a perfect seal. The valve wheel (8) is made of bakelite.

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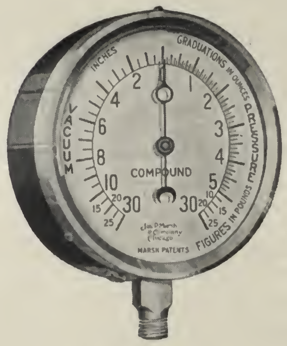
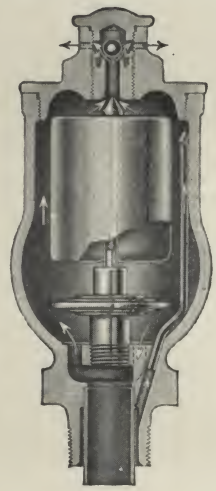
Boiler Room System Units For One Pipe Vacuum Systems



No. 83 Compound Retard Gauge

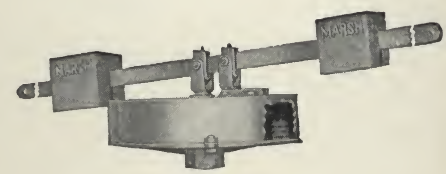
A sensitive gauge that will indicate to the operator the slightest change in pressure is essential. The Marsh No. 83 Compound Retard Gauge was designed expressly for this service, having a sensitive spring that will register the slightest change in pressure. Dial is graduated in ounces up to 5 pounds, and in 5-pound graduations from 5 to 30 pounds. For sub-atmospheric pressures, the depth of vacuum is indicated in wide half-inch graduations up to 10 inches, and in 5-inch graduations from 10 to 30 inches. Sizes, 3½-inch to 10-inch dial.



No. 5 Vent

This vent is the air expelling unit at the ends of steam mains. It expels air until steam has reached the thermostatic element. When steam reaches this element, it expands upwardly, closing the outlet port and preventing vapor from escaping.

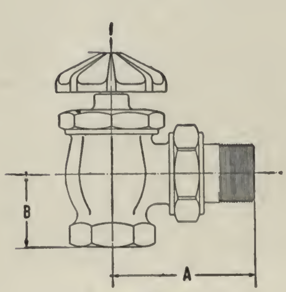
This vent is fitted with a float to eliminate the possibilities of water surging and also a vacuum top feature to prevent air from re-entering the system.



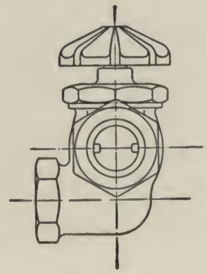
Type D-10 Damper Regulator

The boiler on this system is equipped with this sensitive regulator—the purpose of which is to insure the operator against waste of fuel by controlling the amount of vapor generated in accordance with adjustment based on outside weather conditions. It operates automatically through a sensitive laminated metal bellows which actuates a lever arm balanced by weights. This arm through the medium of a chain opens and closes check and draft dampers on the boiler. This regulator comes equipped with 48-inch lever weight, two bell cranks, 12 feet of chain and 1 inch female pipe connection.

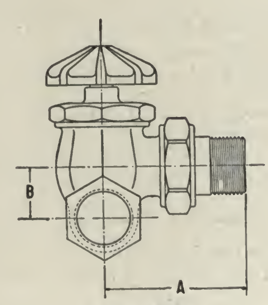
Dimensions Marsh System Unit Packless Radiator Valves



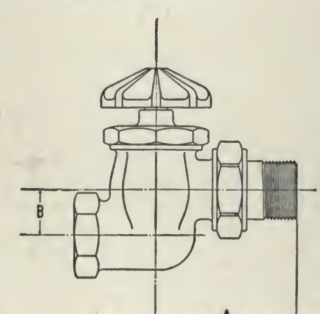
No. 100-A (Angle)



No. 100-L (Left Hand Corner)



No. 100-R (Right Hand Corner)



No. 100-B (Back Offset)

DIMENSIONS IN INCHES (No. 100-A)

Size	A	B
½″	2⅜″	1 3/16″
¾″	2⅞″	1 3/16″
1 ″	3⅛″	1 9/16″
1¼″	3⅝″	1¾″
1½″	3⅞″	1½″
2 ″	4⅜″	2⅜″

DIMENSIONS IN INCHES (No. 100-L, No. 100-R)

Size	A	B
½″	2⅜″	¾″
¾″	2⅞″	27/32″
1 ″	3⅛″	⅞″
1¼″	3⅝″	1⅛″
1½″	3⅞″	1¼″
2 ″	4⅜″	1½″

DIMENSIONS IN INCHES (No. 100-B)

Size	A	B
½″	1⅜″	2⅜″
¾″	1⅜″	2⅞″
1 ″	1 11/16″	3⅛″
1¼″	2 ″	3⅝″
1½″	2⅜″	3⅞″
2 ″	3 1/16″	4⅜″

Continued on next page

Typical Specifications for Marsh One Pipe Vacuum System

1. General Conditions—The general conditions governing this portion of the work shall be in accordance with those of the American Institute of Architects and installation shall be in accordance with Standard Practices of the local association of contractors.

2. Scope of Work—The work to be done includes the furnishing of all labor and materials for the complete erection of a Marsh One Pipe Vacuum System as hereinafter specified and as shown on drawings. Work to be done shall be executed in a neat and workmanlike manner, and all heating apparatus pertaining to this portion of the work to be of the best grade materials and shall strictly conform to these specifications.

3. Boiler—Furnish and install a ...... type boiler as manufactured by ...... having a guaranteed rating of .... sq. ft. of radiation. Boiler shall be equipped with all necessary trimmings and accessories, including Marsh Compound Vacuum and Pressure Gauge, Kunkle Pop Safety Valve and Type D-10 Damper Regulator.

The above boiler shall be connected to chimney with a .... in. breeching of .... gauge black steel, all as shown on plans.

4. Pipe and Fittings—Contractor shall furnish and install where indicated on plans all pipe and fittings properly supported and graded to insure a complete and successful operation of the system. Fittings to be of standard best grade cast iron, and pipe to be of mild black steel properly threaded and reamed. Joints to be made up with a paste consisting of Portland cement and boiled linseed oil applied to male threads only. Proper provision to be made for expansion in all mains, risers and branches.

Boiler header shall be made up of standard flanged fittings connected to boiler full size of steam opening, same to be dripped to return header through a bleeder. All spring pieces to steam mains shall be taken out of top of mains on upfeed systems, and out of bottom of steam mains on downfeed systems. All runouts or branches to radiators or risers to be graded 1 in. in 5 ft. and supply mains 1 in. in 10 ft. Steam mains shall be carried to their terminus and there dropped below the water line of boiler and vented with a Marsh No. 5 Vent with a swing check valve at the base of the line. Wet return main shall be carried back to boiler and connected to the header bleeder through a loop connection.

5. Covering—All steam mains, risers and runouts that are exposed shall be covered with an approved air cell covering 1 in. thick, same to be canvased and banded in a neat and workmanlike manner. Fittings to be covered with plastic asbestos cement troweled smooth and canvased. System shall be tested with water for leaks before covering of piping is commenced.

6. Floor Plates—Where pipes project through finished floor, ceiling or wall, provide an approved type nickelplated floor or ceiling plate.

7. Radiator—Furnish and install where shown on plans a total of .... sq. ft. of direct steam radiation, as manufactured by .... or equal, to have bottom supply and a provision for air valve below center of radiator. Contractors must instruct manufacturers to wash sections free of all core sand and plug all openings.

8. Painting—All radiation and exposed piping shall be given one priming coat of flat paint and one coat of paint to match surrounding decorations, except where piping is to be covered, all as directed by the architect. Boiler and smoke breeching to be given two coats of graphite paint.

9. Air Valves—On each radiator a Marsh System Unit Air and Vacuum Valve is to be placed on radiator in the opening provided for by radiator manufacturers.

10. Radiator Valves—At the bottom of each radiator install a Marsh System Unit Quick Opening Packless Radiator Valve of a size to be determined by schedule below.

TAPPING SCHEDULE

Sq. ft.	Valve
0– 30	1 "
31– 60	1¼"
61–100	1½"
100 up	2 "

Test for Tightness—Before pipe covering is installed, the heating contractor shall conduct the following test for tightness of joints: Build a brisk fire in the boiler, filling all radiators with steam. When gauge indicates 5 lbs., draw fire. After pressure has dropped, the gauge shall show a vacuum of at least ten inches. After reaching maximum, indication on the gauge shall recede at a rate of not more than 1 in. of vacuum per hour. The contractor must see that all piping withstands this test.

11. Cleaning System—System shall be operated for a period of several days with condensation wasted to sewer. Boiler shall then be blowed down through the bottom blow-off connection under 5-lb. pressure. Remove safety valve and connect piping from this opening to sewer properly valved. Fill boiler to proper water level, build hot fire to create at least 5-lb. pressure and open valve in top blow-off connection, feeding enough water to boiler to maintain a constant water level. After four hours firing in this manner, fill boiler with water and allow hot water to flow out of top blow-off connection for one hour. Draw the fire, shut off feed water and blow down through bottom blow-off connection. Allow boiler to cool, replace safety valve and fill boiler with fresh water to proper level.

12. Guarantee—The contractor shall guarantee in the entire system a complete continuous and noiseless circulation of steam to each radiator or coil, free of all air and condensation, at a pressure not to exceed .... lb. gauge. He shall also hold himself responsible for any defects which may develop in any part of the system, including piping, valves or other apparatus included in this specification, due to faulty workmanship, design or material at any time within .... years from date of final payment and shall remedy such defects at his own cost.

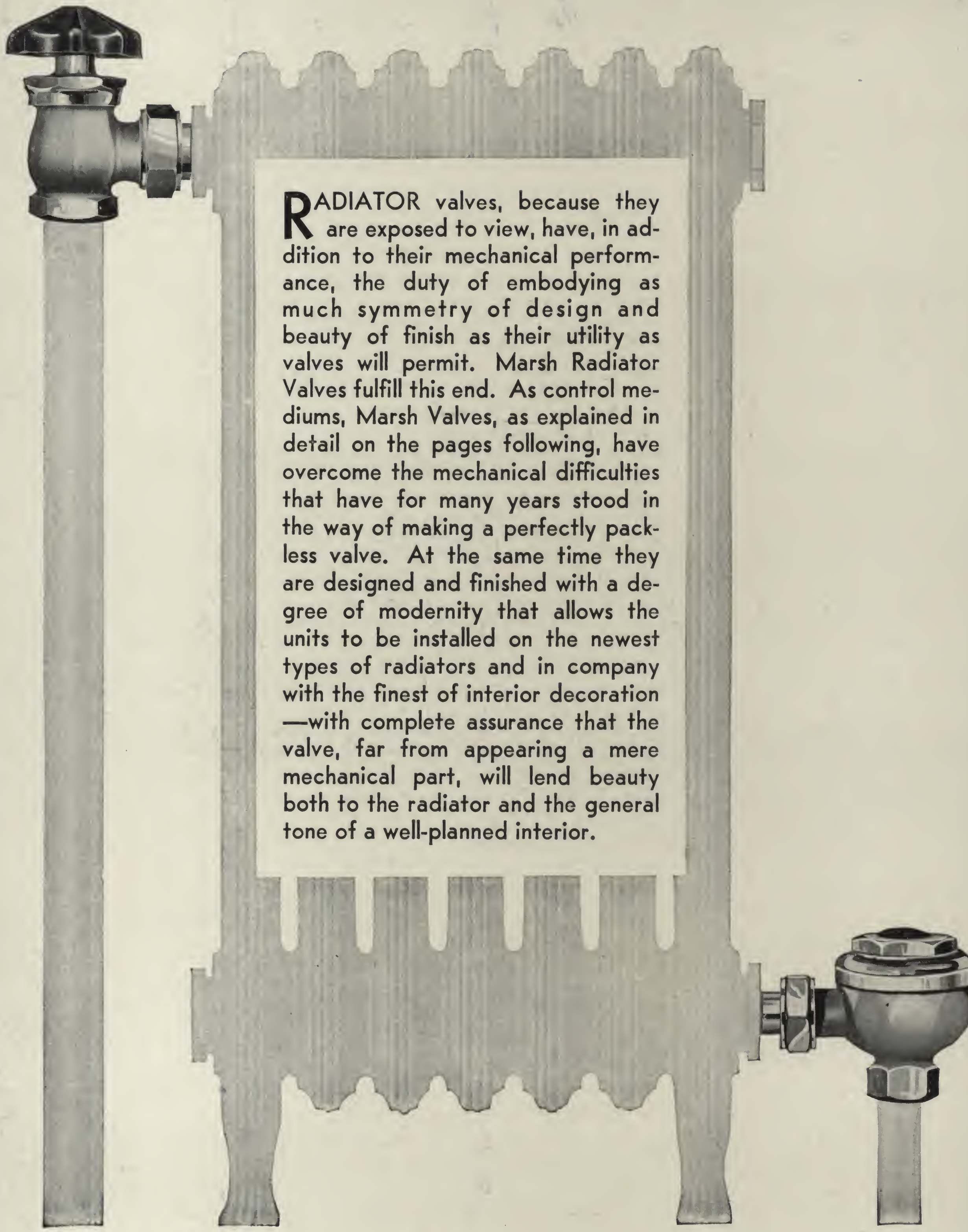
13. Finally—The true intent of these specifications is to bring about the satisfactory completion of the system as outlined above, and nothing contained herein can be construed to relieve the contractor from making good and perfect the work in all usual details of construction, and he will be held responsible and bear all expenses incidental to the satisfactory completion of the work.

MARSH SYSTEM UNIT RADIATOR VALVES

Bulletin No. 150

Packless and Graduated Radiator Valves

JAS. P. **MARSH** & COMPANY
CHICAGO



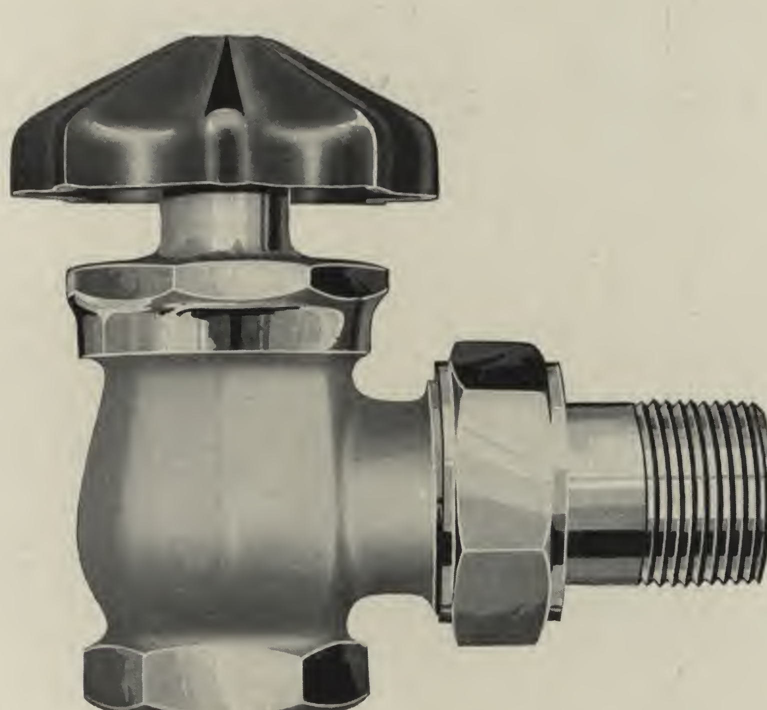
RADIATOR valves, because they are exposed to view, have, in addition to their mechanical performance, the duty of embodying as much symmetry of design and beauty of finish as their utility as valves will permit. Marsh Radiator Valves fulfill this end. As control mediums, Marsh Valves, as explained in detail on the pages following, have overcome the mechanical difficulties that have for many years stood in the way of making a perfectly packless valve. At the same time they are designed and finished with a degree of modernity that allows the units to be installed on the newest types of radiators and in company with the finest of interior decoration—with complete assurance that the valve, far from appearing a mere mechanical part, will lend beauty both to the radiator and the general tone of a well-planned interior.

MARSH SYSTEM UNIT RADIATOR VALVES

IN keeping with the modern trend of architecture JAS. P. MARSH & COMPANY has designed the new Marsh System Unit Radiator Valve which combines beauty with mechanical perfection. Now, radiator fittings as well as radiators themselves may be worked into interior design and be in keeping with the finest of furnishings.

This New Marsh Radiator Valve is modern in design. The simplicity of its lines, the two-tone polished and satin chrome or nickel body finish, crowned by a control wheel or lever of bakelite of distinctive proportions, places this heating necessity abreast of modern trend.

Yet, with all the advanced beauty of design this valve has that dependability typical of all Marsh products.



The Truly Packless Valve

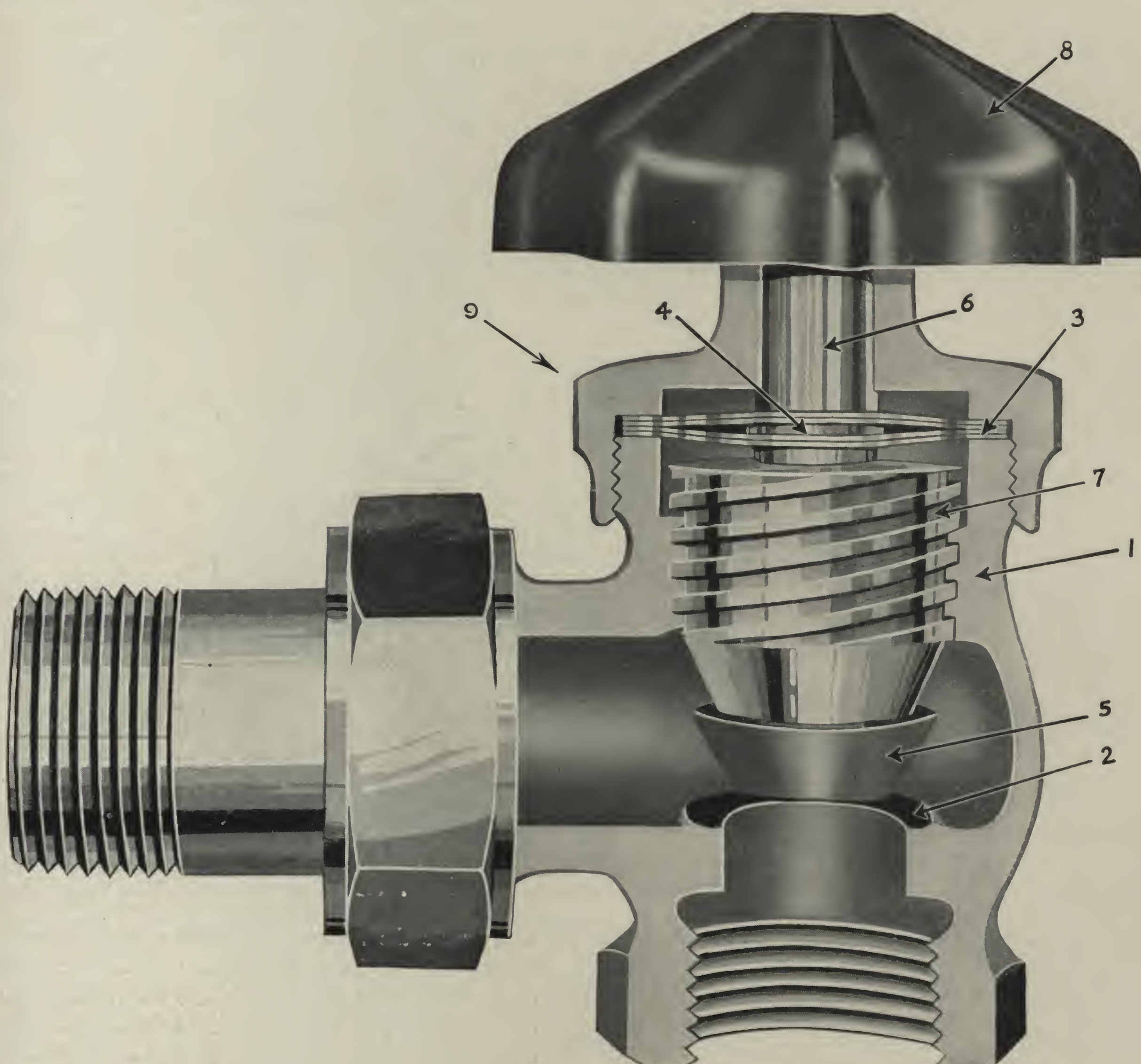
Despite numerous changes in the design of heating systems since the early days when radiator valves were themselves the sole means of regulating, the radiator valve is still a fundamental part of heating systems.

For many years, it was an accepted practice to repack radiator valves at frequent intervals. The introduction of the first so-called packless valve was an endeavor to overcome this condition. This first "packless" valve relied upon a composition disc and spring construction to achieve its purpose. The rapid deterioration of the materials used, however, resulted in the necessity for a more efficient design. Then came the metal-to-metal valve. In this construction, an auxiliary packing around the stem was required to offset the wear of the metal parts due to friction. Still later came the bellows and multiple diaphragm types. These formed a perfect seal but were subject to the dangers of cracking due to strain in service.

The Marsh System Unit Radiator Valve is truly packless. At the same time, its packless feature is not subject to deterioration, wear or cracking. We have confidence in the principles upon which it has been designed. These principles have proven as sound as they are new.

Continued on next page

View Showing
Interior and Construction
of the
Marsh System Unit Packless Radiator Valve



1—Valve Body
2—Valve Seat
3—Metalflex Sealing Discs
4—Stem Collar
5—Flexcone Valve Disc
6—Valve Stem
7—Thrust Screw
8—Bakelite Handle
9—Valve Bonnet

Continued on next page

Construction of Marsh System Unit Radiator Valves

The construction of Marsh System Unit Radiator Valves consists of two major assemblies, the valve mechanism and the bonnet assembly.

The body (1) of the valve is a steam bronze casting accurately machined and tested to 125 pounds pressure. Modern methods of machining on all parts of the body including the thrust screw thread and the bonnet (9) are employed, gaged by micrometer scale, making all parts uniform and interchangeable.

The valve seat (2), built integrally into the valve body, in combination with the Flexcone valve disc (5) permits of large, full capacity flow through the valve. In the case of the graduated type valve this construction makes for very fine modulation of the flow.

The lift thread, in which the thrust screw (7) operates, is cut integrally into the main body casting, allowing a large, deep thread, and adding to the wall thickness and strength of the body casting.

The thrust screw consists of a bronze forging with a large, heavy, quadruple lift thread of sizable proportions which operates directly into a similar thread machined into the valve body. This construction makes the valve quick opening, even in the larger sizes. It also permits of "slow" thread construction lending power to the operation of the valve and contributing to the easy operation of the entire valve, eliminating all possibility of sticking or clogging of the threads. In actual test it has been impossible to clog or stick the thread under the most severe operating conditions. The large diameter thread also assures perfect, continuous seating of the valve. Either entirely closed or partially open, the valve seat, at a given position, remains in that position until manually reset. Chattering or pressure vibration does not disturb the setting.

The patented Flexcone valve seat (5) is a drawn monel metal spring cup permanently riveted to the thrust screw. This assembly is swivelled, permitting the disc (5) to make a perfect seating at all times.

The cone shape of the valve disc in combination with the large area of the opening in the valve seat gives this valve large, full, pipe size flow capacity when fully opened. The cone shape acts as a deflector in cutting the flow of water and diverting it to the proper angle of flow into the radiator and does not restrict flow as in the case of the Jenkins type flat disc used in other types of valves.

In the graduated type valve, the Flexcone valve disc raising and lowering in the orifice of the valve seat modulates the area of the opening and in that way controls the flow in direct proportion to the setting of the indicator and dial (parts 3 and 4 in illustration on following page).

The valve assembly (parts 7 and 5) are operated by a valve stem (6) which fits loosely into a tongue and groove arrangement within the thrust screw. As the valve stem is rotated by wheel (8) or by the turning of lever handle, it in turn rotates the thrust screw raising or lowering it in the body thread.

Integrally incorporated in the valve stem is a perfectly machined stem collar (4) which in conjunction with the Metalflex sealing discs (3) make the unique, positive and perfect sealing packless arrangement built into this valve. The Metalflex sealing discs consist of two sets of thin metal divided with a hole, through which the valve stem passes. The upper set of discs consists of a monel metal diaphragm in contact at the center with the flat diaphragm in contact at the center with the flat upper surface of the stem collar and a stainless spring steel diaphragm resting on top of the monel diaphragm. The lower set of discs has a similar monel metal diaphragm in contact with the lower flat surface of the stem collar and a stainless spring steel diaphragm resting against the monel metal diaphragm. This assembly separates the upper and lower sets of discs from each other by the thickness of the stem collar.

The entire assembly of valve stem and Metalflex sealing discs is installed into the valve body assembly. The valve bonnet (9) as screwed onto the valve body fits around valve stem, lining up the latter and at the same time compressing the upper set of Metalflex discs tightly against the lower set of discs forming a perfect seal at the outer periphery. At the same time this compresses the two sets of Metalflex discs against the stem collar, creating a self-spring seal as the stem collar rests or rotates between the two monel metal diaphragms.

The valve wheel is made of Bakelite. It is of unique design and its form lends itself to perfect fit of the hand. This form also allows air currents to circulate under and around the wheel assuring coolness to the touch. The lever handle construction consists of a forging formed to match the balance of the Marsh System Unit Valve design and is fitted with a bakelite lever.

Union nut and tail piece are made of hard brass forgings. The tail piece construction includes two lugs for easy installation into the radiator fitting.

Tests

Laboratory tests of Marsh System Unit Valves calculated to definitely prove the efficiency and perfection of the unique construction, have subjected these units to service many times that of normal operation. To test the wearing qualities of the Flexcone valve disc and bronze valve seat, completely assembled valves have been tested upwards of 30,000 operations, on pressures from vacuum to several hundred pounds, without showing any appreciable signs of wear.

These same tests applied prove the packless and sealing qualities of the Metalflex sealing discs and the stem collar, which following upwards of 30,000 operations show no appreciable wear and resulted in no strain of component parts.

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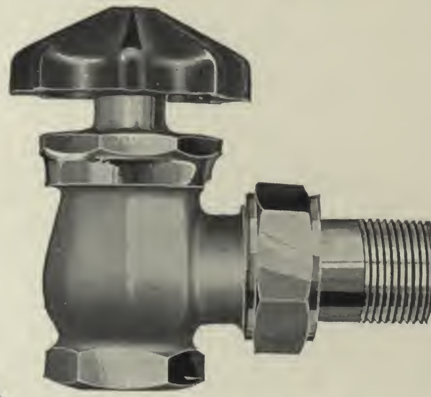
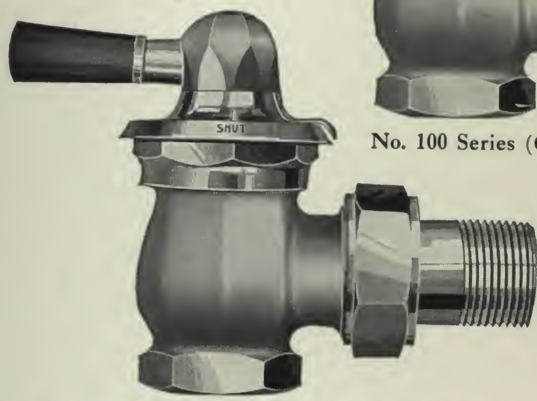
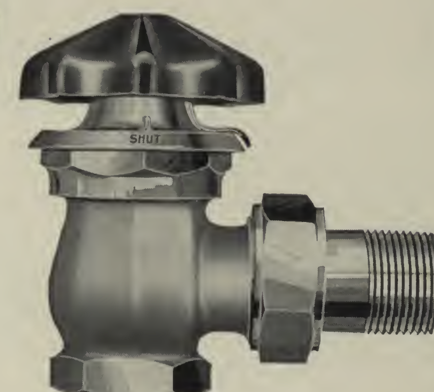
Different Types of Marsh System Unit Radiator Valves



No. 100 Series (Oval Wheel Packless)



No. 102 Series (Lever Handle—Graduated)



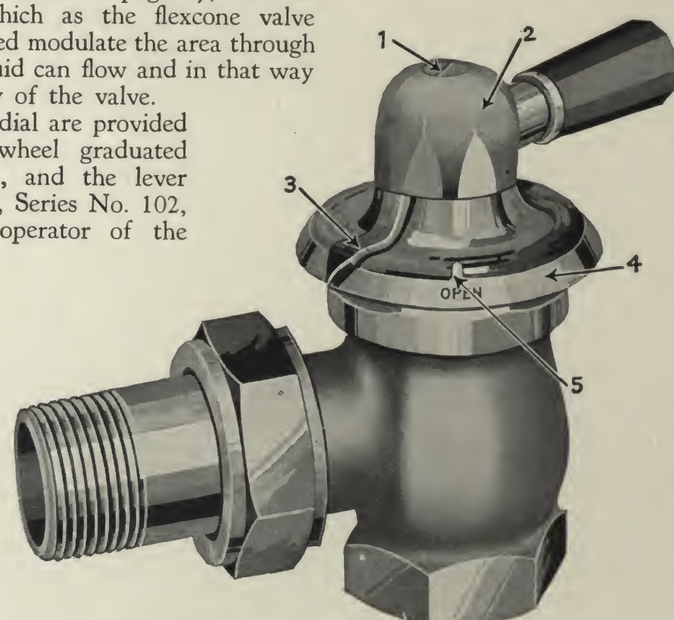
No. 101 Series (Oval Wheel—Graduated)

The Graduated Type of Marsh System Unit Radiator Valve

In the Marsh Graduated Type Packless Radiator Valve a means is provided whereby the total capacity of the valve is adjusted in proportion to the size of the radiator, operating the valve so as to limit the flow through the valve in quantities graded approximately according to weather requirements. The flexcone valve disc, together with the valve seat (parts 5 and 2 in illustration on page 2), form an orifice arrangement which as the flexcone valve disc is raised and lowered modulate the area through which the steam or liquid can flow and in that way graduating the capacity of the valve.

An indicator and dial are provided with both the oval wheel graduated valve, Series No. 101, and the lever handle graduated valve, Series No. 102, acting to guide the operator of the valve as to the proper setting for the desired flow.

This construction provides a simple means for the steamfitter, or any other authorized person to calibrate the total capacity found expedient according to the size of the radiator upon which it is installed.



This simple operation is as follows:

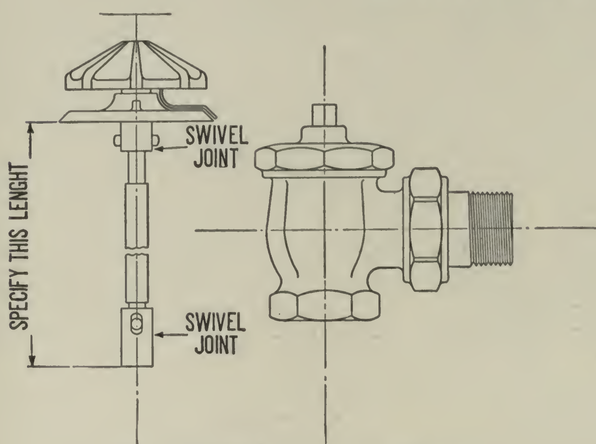
With the valve installed, set the percentage of full opening desired. Remove graduating assembly (parts 1, 2, 3 and 4 of the accompanying illustration), replace dial (4) in such position on the valve that indicating field is in full view of operator. Replace indicator (3) directly against "open" pin (5) on the graduating field side. Replace lever handle bonnet (2) and screw (1).

The valve is now calibrated for the desired maximum opening. Also, so arranged that the occupant can change the proportional flow through the valve as desired.

In the case of the Series No. 101 oval wheel graduated valve the operation is the same except that the oval wheel is removed instead of the lever handle bonnet to permit changing of dial and indicator and is replaced, following the changing operation.

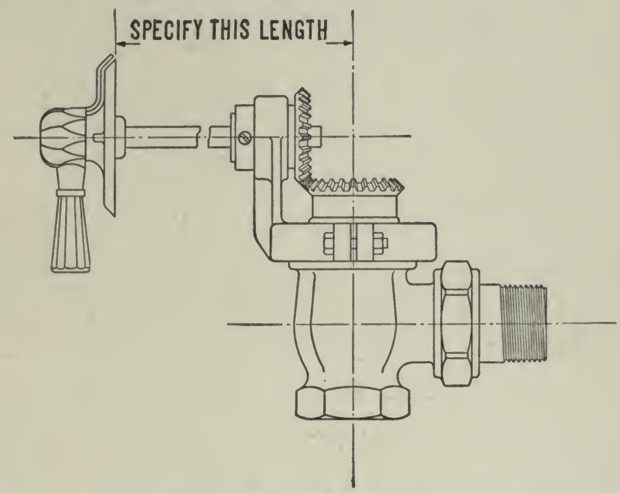
Continued on next page

Radiator Valve Accessories



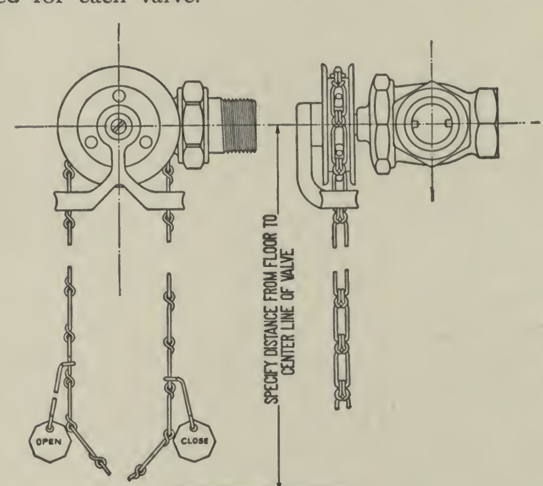
No. 200 Extension Stem

This type of extension stem is utilized in connection with radiator valves installed in radiator furniture, radiator cabinets, and behind grilles, where the wheel and dial indicator are placed at the top of the enclosure. Also where the valve is so installed that the stem is horizontal, permitting the wheel and dial to be placed on the face of the enclosure. The unique universal swivel joints permit the handle of the extension to be located in an off center position where desired. Furnished with wheel or lever handle, indicator and dial and with extension rod in standard lengths which can be cut to correct lengths on the job. The entire distance of extension, as shown in the illustration, should always be specified for each valve.



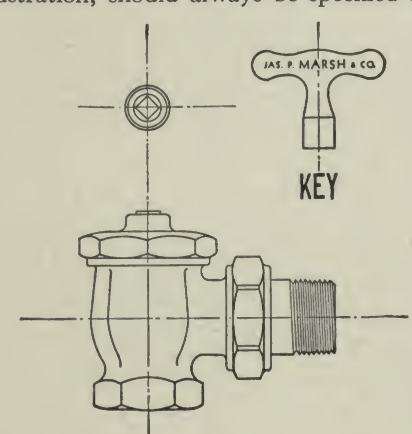
No. 201 Geared Extension Stem

Application of this extension stem assembly permits installation of valves behind grilles and in connection with concealed radiation where access to the wheel is not available above the radiator or where it is not possible to install the valve so that the stem is horizontal. This attachment permits installation of the wheel or lever, together with dial and indicator, on the face of the enclosure regardless of the type or position of the valve. Also permits opening and closing of the valve with a minimum of turn of the wheel or handle. Also permits fractional operation of graduated type valves. Furnished with wheel or lever handle, indicator and dial and with extension rod in standard lengths which can be cut to correct length on the job. The entire distance of extension, as shown in the illustration, should always be specified for each valve.



No. 202 Chain Type Extension

This attachment is available for all sizes and types of Marsh System Unit Packless Valves and is adaptable to use where radiators are located on the ceiling or on the wall near the ceiling out of reach of the operator. Consists of a grooved sprocket operated by chain belt, requiring a minimum turn to open or close valve. Chain is furnished in any length to meet conditions for which it is intended, complete with tags indicating "open" and "closed" position.



No. 103 Lock Radiator Valve

In order to meet the demand for a locking device on radiator valves located in public buildings, lobbies, offices, etc., the Marsh No. 103 Lock and Shield Radiator Valve can be furnished in all patterns and all sizes up to 2 inches, and No. 104 Graduated Lock and Shield Valves. Separable key permits only authorized persons to change the required setting of the valve.

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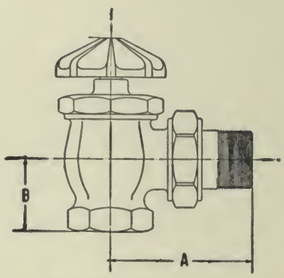
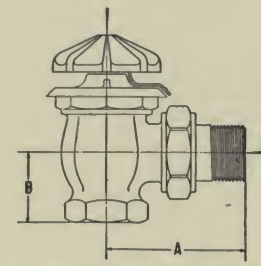
Patterns and Roughing-in Dimensions of Marsh System Unit Packless Radiator Valves



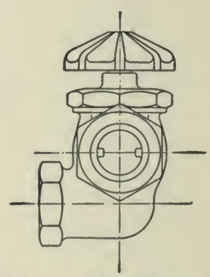
No. 100-A (Wheel Angle)

DIMENSIONS IN INCHES

Sizes	A	B
½″	2⅜″	1 3/16″
¾″	2⅞″	1 3/16″
1 ″	3⅛″	1 9/16″
1¼″	3⅝″	1¾″
1½″	3⅞″	1½″
2 ″	4⅜″	2⅜″



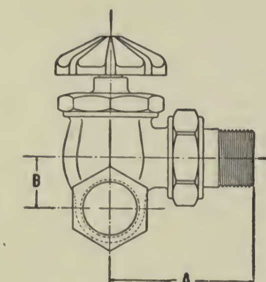
No. 101-A (Wheel Angle—Graduated)



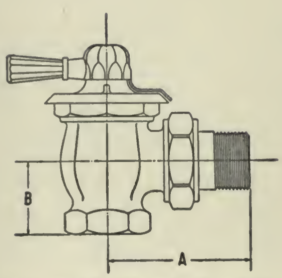
No. 100-L (Wheel Left Hand Corner)

DIMENSIONS IN INCHES

Sizes	A	B
½″	2⅜″	¾″
¾″	2⅞″	27/32″
1 ″	3⅛″	⅞″
1¼″	3⅝″	1⅛″
1½″	3⅞″	1¼″
2 ″	4⅜″	1½″



No. 100-R (Wheel Right Hand Corner)



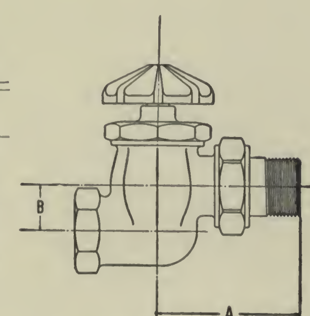
No. 102-A (Lever Handle)

DIMENSIONS IN INCHES

Sizes	A	B
½″	2⅜″	1 3/16″
¾″	2⅞″	1 3/16″
1 ″	3⅛″	1 9/16″
1¼″	3⅝″	1¾″
1½″	3⅞″	1½″
2 ″	4⅜″	2⅜″

DIMENSIONS IN INCHES

Sizes	A	B
½″	1⅜″	2⅜″
¾″	1⅜″	2⅞″
1 ″	1 11/16″	3⅛″
1¼″	2 ″	3⅝″
1½″	2⅜″	3⅞″
2 ″	3 1/16″	4⅜″



No. 100-B (Back Offset)

Explanation of Dimensional Tables

Type No. 101 (wheel handle) and Type No. 102 (lever handle) graduated valves as made in left hand corner pattern, right hand corner pattern and back offset pattern have the same roughing-in dimensions shown above for the Type 100 valves in these patterns.

Roughing-in dimensions for Type Nos. 103 Lock and Shield Packless Valve and 104 Lock and Shield Graduated Valves in all patterns are the same as Type No. 100.

TYPES AND PATTERNS OF MARSH SYSTEM UNIT RADIATOR VALVES

Type	Pattern	Symbol	Type	Pattern	Symbol
Wheel Handle	Angle	100-A	Lever Handle Graduated	Angle	102-A
Wheel Handle	Left Hand Corner	100-L	Lever Handle Graduated	Left Hand Corner	102-L
Wheel Handle	Right Hand Corner	100-R	Lever Handle Graduated	Right Hand Corner	102-R
Wheel Handle	Back Offset	100-B	Lever Handle Graduated	Back Offset	102-B
Wheel Handle Graduated	Angle	101-A	Lock and Shield	Angle	103-A
Wheel Handle Graduated	Left Hand Corner	101-L	Lock and Shield	Left Hand Corner	103-L
Wheel Handle Graduated	Right Hand Corner	101-R	Lock and Shield	Right Hand Corner	103-R
Wheel Handle Graduated	Back Offset	101-B	Lock and Shield	Back Offset	103-B

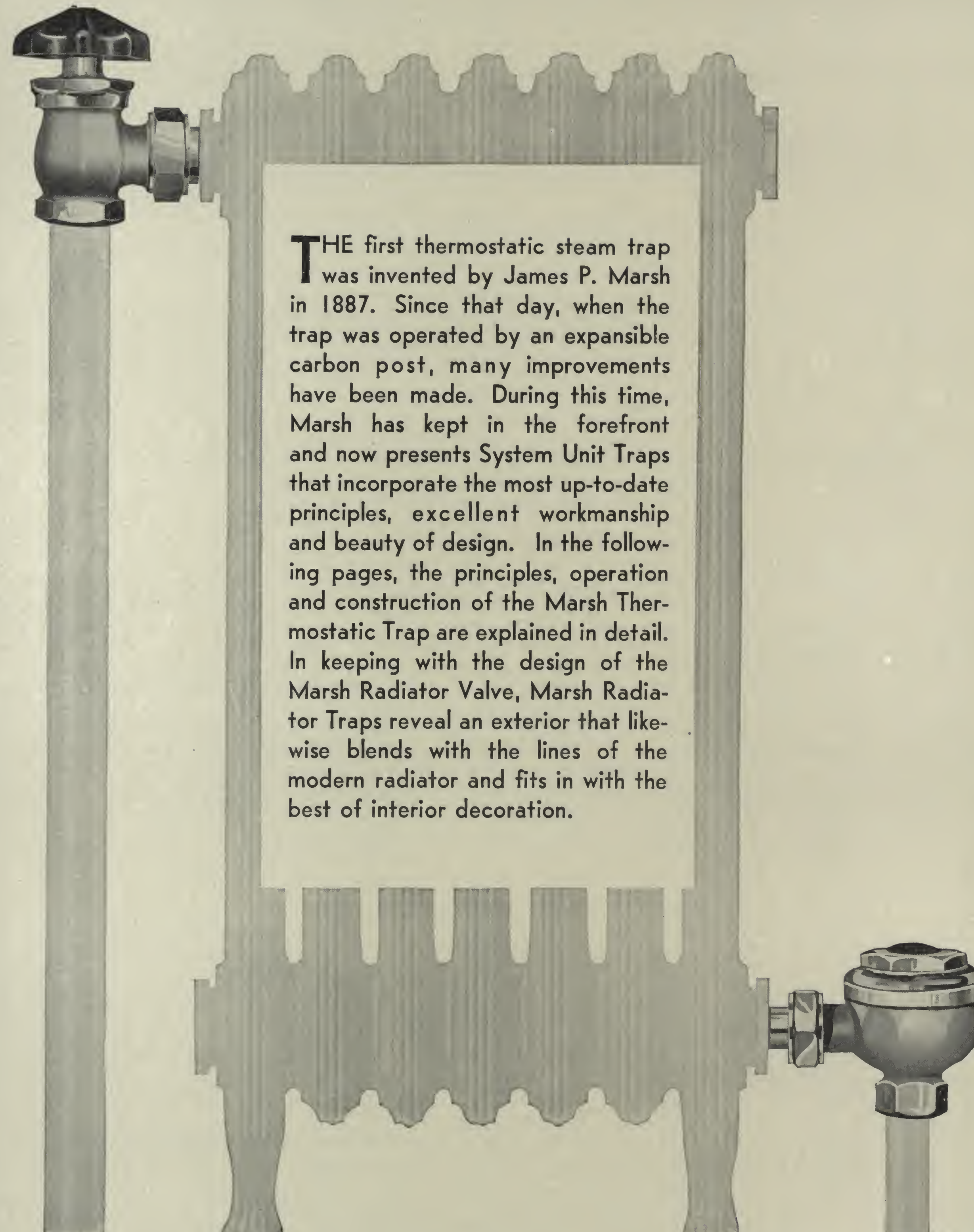
Note: Lock and shield construction can also be supplied in the graduated type valve—specified as No. 104—in any pattern listed above.

MARSH SYSTEM UNIT TRAPS

Bulletin No. 175

Radiator, Drip, Float and Heavy Duty Traps

JAS. P. MARSH & COMPANY
CHICAGO

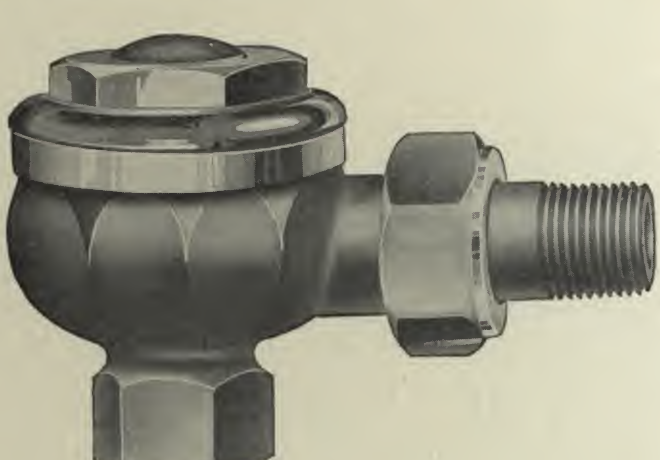


THE first thermostatic steam trap was invented by James P. Marsh in 1887. Since that day, when the trap was operated by an expansible carbon post, many improvements have been made. During this time, Marsh has kept in the forefront and now presents System Unit Traps that incorporate the most up-to-date principles, excellent workmanship and beauty of design. In the following pages, the principles, operation and construction of the Marsh Thermostatic Trap are explained in detail. In keeping with the design of the Marsh Radiator Valve, Marsh Radiator Traps reveal an exterior that likewise blends with the lines of the modern radiator and fits in with the best of interior decoration.

MARSH SYSTEM UNIT THERMOSTATIC RADIATOR TRAPS

IN keeping with the modern trend of architecture, Marsh System Unit Radiator Traps and Radiator Valves, as well as the radiators themselves, are now available in designs which can be worked into and match with the finest interior decorations and furnishings. The octagonal body lines of Marsh System Unit Radiator Traps blend perfectly with the body lines found in the modern tubular radiator and as installed on the radiator in combination with the Marsh System Unit Radiator Valve have a decided effect upon the improved appearance of the modern radiator as a whole. Marsh System Unit Radiator Traps in combination with Marsh System Unit Radiator Valves are manufactured in two tone lustrous polished and satin finish and obtainable in lustrous chrome or nickel finish.

Yet with all the advanced beauty of design, this Marsh System Unit has that dependability which is typical of all Marsh products.



Function of the Radiator Trap

It is essential to economical and satisfactory operation of any steam or vapor heating system to obtain as much heat as possible from the steam which has been delivered to the radiator. It is the function of the Marsh System Unit Radiator Trap, as installed at the outlet of the radiator, to accomplish this result by retaining the steam within the radiator until it has delivered to the radiator its heat units. While it is essential to retain steam within the radiator and thus conserve heat, it is equally essential that all water of condensate, air and other gases be passed out of the radiator into the return system promptly. The accomplishment of these results is entirely dependent upon the sensitive operation of the thermostatic diaphragm within the range where steam, water and air are at temperatures varying only slightly from each other. It is the sensitive and proper reaction to these varying elements and their respective temperatures which makes for the high efficiency of the Marsh System Unit Thermostatic Radiator Trap and economical and efficient operation of Marsh Vacuum and Vapor Heating Systems.

The thermostatic trap as installed upon the radiator has a second important function; that of automatically maintaining the necessary difference in pressure or vacuum between supply and return systems, assuring circulation throughout the entire heating system, resulting in full steam supply to the radiators and flow of condensate, air and gases away from the radiator. This function must be promptly and efficiently accomplished either with the aid of the induced vacuum provided by the vacuum pump in a standard vacuum system, or through natural gravity circulation in the vapor system of heating. This service likewise the Marsh System Unit Radiator Trap performs perfectly due to its ability to maintain a perfect seal between the radiator and return system, except when opened to pass water, air and non-condensable gases into the return system.

Principle of Operation

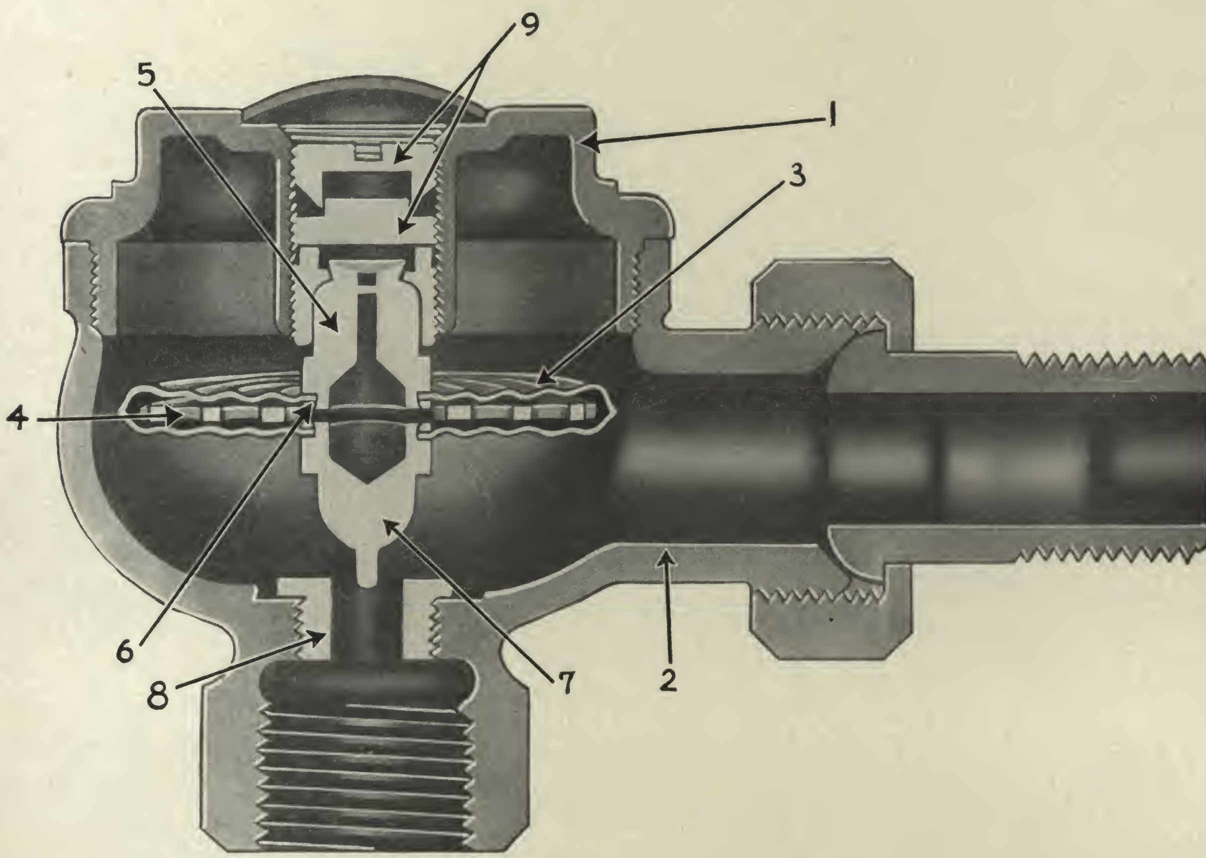
Steam supplied from the boiler or from a central source of supply is circulated through the supply piping, enters the radiator and circulates through the sections of the radiator, forcing air ahead of it until the air has passed through the radiator and on through the radiator trap, which is opened for that purpose, into the return piping. As the steam passes through the radiator and comes in contact with the lower temperature of the radiator walls it gives off heat to the radiator walls and condenses. This water of condensate and the air and non-condensable gases liberated from the steam pass through the trap into the return piping until the radiator is completely filled with steam. When steam reaches the trap, through expansion by the heating of a combination of volatile fluids, the diaphragm in which they are contained likewise expands and carries the valve needle against the trap seat closing the trap and retaining the steam in the radiator. The steam contained in the radiator condenses to give off its heat to the lower temperatured radiator walls, which in turn pass the heat on into the still lower temperatured room in which the radiator is contained, thus accomplishing the result of raising the temperature of the room to the desired degree. This process condenses the steam and the resulting water being heavier than the steam drops to the bottom of the radiator. It is permitted to accumulate until it has reached the level of the thermostatic diaphragm in the trap. The lower temperature of the water causes the diaphragm to contract, passing this water of condensate and such air as has accumulated, which likewise is of lower temperature than the steam, into the return system.

This cycle of operation is automatically repeated and continued as long as there is a supply of steam delivered to the radiator.

Continued on next page

View Showing Interior and Construction Marsh System Unit Thermostatic Trap

The illustration on this page shows in detail construction of the Marsh System Unit Thermostatic Trap. This construction is typical of all Marsh Thermostatic Traps as utilized on radiators, drips, etc., and as thermostatic by-pass on Marsh System Unit Heavy Duty Traps. The bonnet assembly, including the thermostatic diaphragm is typical of the thermostatic by-pass incorporated in the construction of the Marsh System Units No. 8 and No. 12 Float and Thermostatic Traps.



1. Trap Bonnet
2. Trap Body
3. Thermostatic Diaphragm
4. Diaphragm Reinforcement
5. Swivel and Adjustment
6. Diaphragm Locking Seal
7. Valve Needle
8. Renewable Seat
9. Adjustment Seal

Continued on next page

General Description
Marsh System Unit Thermostatic Traps

Marsh System Unit Thermostatic Traps as a unit consists of two major assemblies: (1) The body with the renewable seat and the union nut and tail piece. (2) The bonnet with the diaphragm assembly and locking arrangement complete.

Thermostatic Diaphragm

The several unique and patented features, which enter into the construction of the Marsh Thermostatic Diaphragm, are largely responsible for the high degree of efficiency and economy in the operation of Marsh Heating Systems.

Marsh Thermostatic Diaphragms operate on the principle of expansion and contraction of a combination of volatile fluids when subjected to varying temperatures. The volatile fluid contained within the sealed diaphragm expands as temperatures are applied, causing the diaphragm assembly to expand carrying the valve needle against the seat, closing the trap. As the lower temperatures of condensate and air come in contact with the diaphragm these lower temperatures cause the volatile fluid to contract, lowering the internal pressure in the diaphragm, contracting the diaphragm and allowing the passage of condensate, air and gases.

Construction

The expansible portion of the thermostatic diaphragm assembly consists of an upper and lower wafer of tinned phosphor bronze, drawn and spun to perfection of temper. The lower wafer is fastened to the valve needle (7) which consists of a tinned brass screw machine part spun and sweated to the diaphragm wafer. The upper diaphragm wafer is spun and sweated to the adjustment screw assembly consisting of two parts combined to form the adjustment screw (5) and swivel. When the two wafers are assembled, projection on both the upper post (5) and the valve needle (7) combine to form a matched fit when the diaphragm is completely compressed. An interior reinforcement arrangement (4) forms a perfect inner ring reinforcement between the upper and lower wafers so that when the diaphragm is completely compressed it is the equivalent of a solid disc so far as power to withstand overpressure or water hammer is concerned. The two wafers are assembled on the outer periphery by a spinning and sweating operation. The volatile fluid is then injected through the upper post (5) in carefully measured quantities, following which the opening in post (5) is plugged and sweated shut. The entire diaphragm assembly is then treated by one of the most important exclusive Marsh diaphragm construction features. The entire diaphragm assembly is given an overlay, by an electro-plating process, of a thick application of copper metal.

Bonnet Assembly

In the construction of Marsh System Unit Thermostatic Traps the diaphragm assembly is screwed into the bonnet assembly. The construction of the Marsh System Unit Bonnet is designed to permit the accurate adjustment of each trap under actual operating conditions and is not a "jig" adjustment. Following such adjustment the diaphragm assembly is securely locked into the bonnet, which is a brass forging, by means of lock washers (9) and name plate shown at the top of the illustration completes the bonnet assembly. The bonnet is accurately threaded and machined to make steam and vacuum tight assembly to the body without the use of any pipe cement.

Body Assembly

The body (2) of Marsh System Unit Thermostatic Traps is a steam bronze casting accurately machined and tested to 125 pounds working pressure. Modern methods of machining on all parts, including the body (2) and bonnet (1) are employed, gaged by micrometer scale with a tolerance of .007 inches which allows all parts to be interchangeable due to uniformity.

Marsh System Unit Thermostatic Traps are built with renewable seat (8) made of a hard brass screw machine part. In actual service this accurately machined seat and the accurately machined needle valve (7) require no renewal over a period of many years of average service on heating systems. However, should unusually severe service cause the seat to wear after many years of service, it is possible to renew the seat by merely removing the old one and screwing in a new one to the locked position. This is seldom necessary.

The union nut and tail piece of Marsh System Unit Thermostatic Radiator Traps are both made of hard brass forgings, which lend themselves to the accuracy of machining and fit so vital in these parts. The tail piece construction includes two lugs for easy installation into the radiator fitting.

Tests

Each Marsh System Unit Thermostatic Trap is individually adjusted and tested by experienced operators under actual operating conditions, assuring accurate calibration and perfect operation in actual service.

While Marsh System Unit Thermostatic Traps are intended for pressure up to 25 pounds, laboratory tests have been conducted to determine breakdown points. As a regular part of routine laboratory tests a percentage of each production of diaphragms is subjected to pressure of several hundred pounds before distortion sets in (many times the normal internal pressure). All Marsh System Unit Thermostatic Diaphragms are capable of withstanding 1000 pounds external pressure without distortion, but are not guaranteed to operate accurately beyond normal pressure of 25 pounds per square inch.

Finish

Marsh System Unit Thermostatic Radiator Traps are finished in two tone polished and satin nickel or chrome to match Marsh System Unit Packless Radiator Valves.

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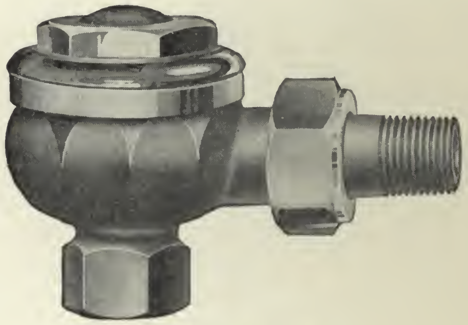
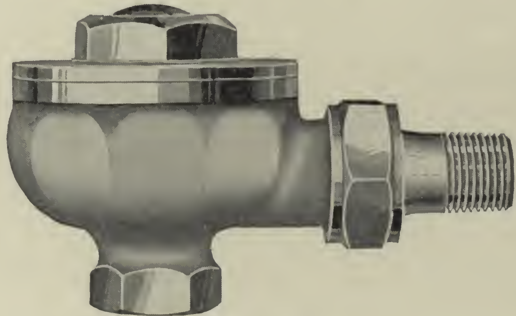
Patterns and Styles Marsh System Unit Thermostatic Traps



No. 1 Series Trap



No. 2 Series Trap

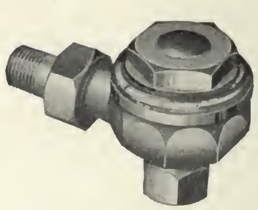
Marsh System Unit Thermostatic Traps are manufactured in two styles: The Marsh No. 1 Series which is made in ½ inch connection size only and the No. 2 Series which is made in three sizes, ½, ¾ and 1 inch. The No. 1 series is obtainable in the following patterns: Angle, Straightway, Right Hand, Left Hand and Back Offset. These same patterns are supplied in the ½ inch No. 2 series. In the ¾ and 1 inch sizes of No. 2 series the following patterns are obtainable: Angle, Right Hand, Left Hand and Back Offset. Both series in all patterns are made in either nickel or chrome finish.

SIZES AND CAPACITIES

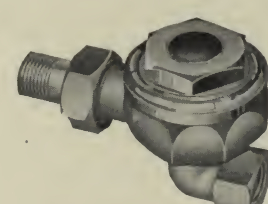
No. 1 Series Radiator Trap		No. 2 Series Radiator Trap	
Sizes	Sq. Ft. C. I. Radiation	Sizes	Sq. Ft. C. I. Radiation
½"x½" connection	150	½" x ½" connection ¾" x ¾" connection 1 " x 1 " connection	200 500 1000

SPECIFICATION SYMBOLS

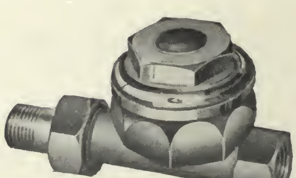
	Trap Pattern	Symbol
No. 1 Series	Angle Pattern	No. 1-A
	Left Hand Corner Pattern	No. 1-L
	Right Hand Corner Pattern	No. 1-R
	Straightway Pattern	No. 1-S
	Back Offset Pattern	No. 1-B
No. 2 Series	Angle Pattern	No. 2-A
	Left Hand Corner Pattern	No. 2-L
	Right Hand Corner Pattern	No. 2-R
	Straightway Pattern	No. 2-S
	Back Offset Pattern	No. 2-B



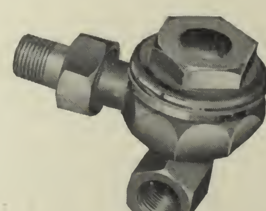
Angle Pattern



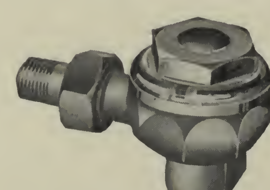
Back Offset Pattern



Straightway Pattern



Left Hand Corner



Right Hand Corner

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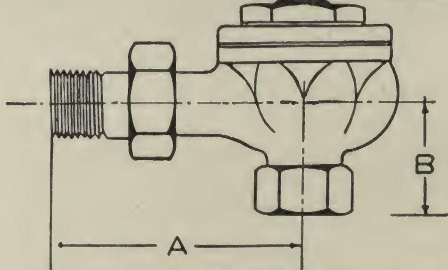
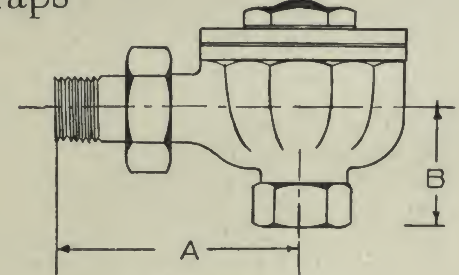
Roughing-in Dimensions of Marsh System Unit Radiator Traps



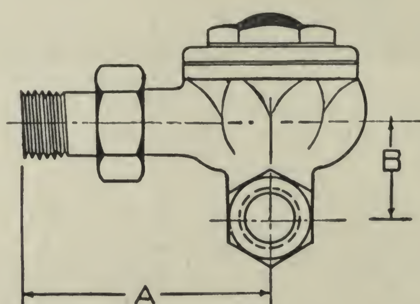
No. 1-A (Angle Pattern)

Size	Capacity	Water	A	B
½″	150 sq. ft.	40 lbs. per hour	3¼″	1½″



No. 2-A (Angle Pattern)

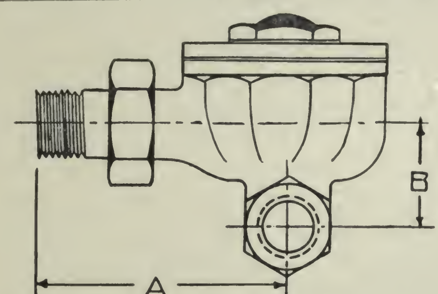
Size	Capacity	Water	A	B
½″	200 sq. ft.	50 lbs. per hour	3½″	1 7/16″
¾″	500 sq. ft.	125 lbs. per hour	3 15/16″	2 ″
1 ″	1000 sq. ft.	250 lbs. per hour	4⅜″	2 1/16″



No. 1-R (Right Hand) and No. 1-L (Left Hand Corner Pattern)

Size	Capacity	Water	A	B
½″	150 sq. ft.	40 lbs. per hour	3¼″	1¼″

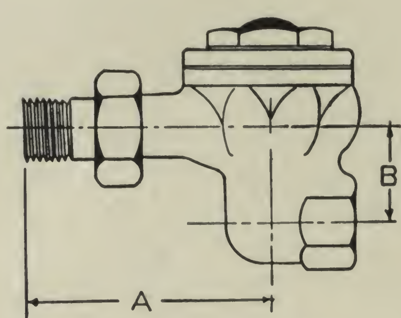
Dimensions on right and left hand pattern are identical.



No. 2-R (Right Hand) and No. 2-L (Left Hand Corner Pattern)

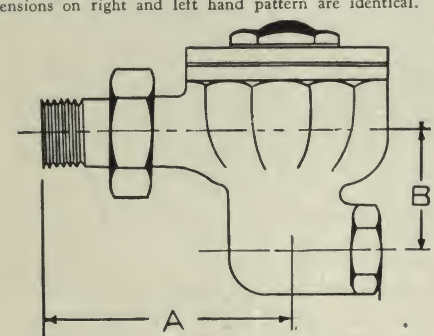
Size	Capacity	Water	A	B
½″	200 sq. ft.	50 lbs. per hour	3¾″	1¼″
¾″	500 sq. ft.	125 lbs. per hour	3 15/16″	1⅝″
1 ″	1000 sq. ft.	250 lbs. per hour	4 5/16″	1⅞″

Dimensions on right and left hand pattern are identical.



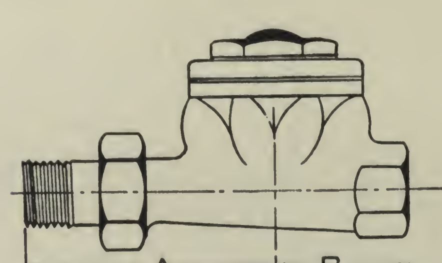
No. 1-B (Back Offset Pattern)

Size	Capacity	Water	A	B	C
½″	150 sq. ft.	40 lbs. per hour	3¼″	1¼″	1⅛″



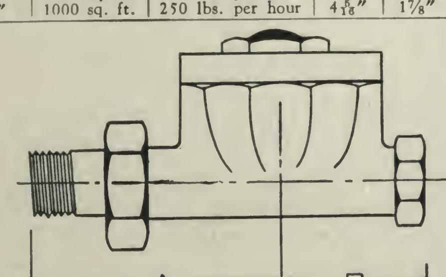
No. 2-B (Back Offset Pattern)

Size	Capacity	Water	A	B	C
½″	200 sq. ft.	50 lbs. per hour	3⅞″	1¼″	1⅜″
¾″	500 sq. ft.	125 lbs. per hour	3 15/16″	1⅝″	1 9/16″
1 ″	1000 sq. ft.	250 lbs. per hour	4 5/16″	1⅞″	1⅝″



No. 1-S (Straightway Pattern)

Size	Capacity	Water	A	B
½″	150 sq. ft.	40 lbs. per hour	3¼″	1¾″



No. 2-S (Straightway Pattern)

Size	Capacity	Water	A	B
½″	200 sq. ft.	50 lbs. per hour	3¾″	2″

Continued on next page

Marsh System Unit Drip Traps

Marsh No. 8 Drip Trap

This trap is continuous in discharge and is designed to quickly remove condensation and air from drip points on steam mains, steam risers, steam coils, or blast heaters, or for any like service within the capacity of the trap.

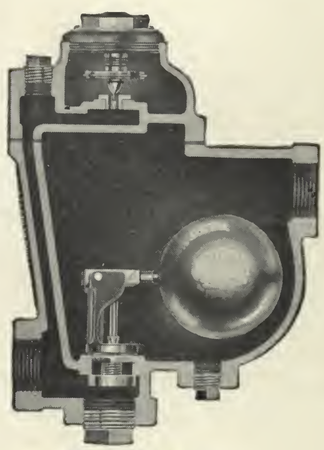
The design permits a deep water seal on the discharge valve. This water discharge valve is float controlled and located at a low point in the bottom of the trap and air is removed through a thermostatically controlled port in the cap of the trap. The thermostatic member used is our standard assembly as in the No. 1 Marsh Radiator Trap. Normally air is discharged through a port directly to the outlet connections of the trap. In cases where the trap may be required to discharge to a wet return the air discharge may be connected to a dry return from a special opening tapped in the cap of the trap.

Body of trap is provided with one 1¼-inch tapped inlet and two 1¼-inch tapped outlet openings. These openings are located so as to permit direct connection both to inlet and from outlet.

The trap may be suspended directly in the piping and no other supports are necessary. The thermostatic element screws directly in the cap of the trap and is interchangeable with the element from the No. 1 Radiator Trap.

All interior parts are of forged bronze castings with the exception of the float which is a seamless copper float tested for a working pressure of 25 pounds per square inch.

Copper asbestos gaskets are used throughout which avoid the necessity of supplying new gaskets whenever trap may be opened for inspection or repair.



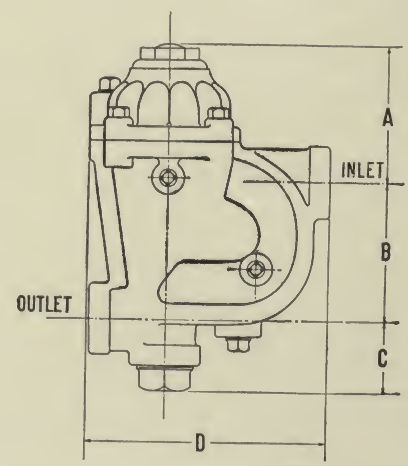
No. 8 Drip Trap

CONNECTION SIZES
1¼-in. Inlet
1¼-in. Outlet

DIMENSIONS
A—4⅜ in.
B—4⅛ in.
C—2¼ in.
D—7 11/16 in.

CAPACITIES

Steam pressure in lb.	Capacities in lb. water per hr.
½	500
1	900
2	1400
3	1600
4	1800
5	2000
10	3200
15	4000



Marsh No. 12 Drip Trap

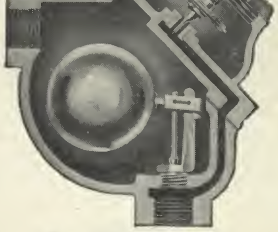
Designed for removal of air and condensation from short steam mains, branches or riser. Unit heaters, steam coils, etc., are within the limits of the capacity of the trap.

The size and weight of the trap permits its installation in the piping without any other means of support.

Condensation is removed through a float operated valve located at the lowest point inside the trap body. Air removal is located in the cap of the trap. Air passes through a passageway and out through the trap outlet.

Body of trap is of cast iron and all interior parts are of forged steam bronze, copper and monel metal.

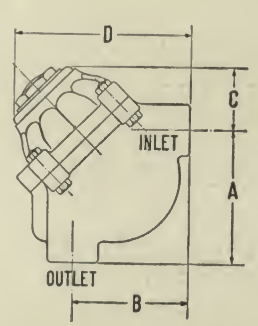
The thermostatic member of the air by-pass is interchangeable with the member of the standard No. 1 Radiator Trap.



No. 12 Drip Trap

CONNECTION SIZES
¾-in. Inlet
¾-in. Outlet

DIMENSIONS
A—4½ in.
B—3⅞ in.
C—1⅞ in.
D—6 in.



CAPACITIES

Steam pressure in lb.	Capacities in lb. water per hr.
½	350
1	600
2	800
3	1200
4	1400
5	1600
10	2000
15	2800

Continued on next page

Marsh System Unit
No. 9 Heavy Duty Trap

The Marsh No. 9 Heavy Duty Trap has a wide field in which it may be applied to equipment using steam as a heating element. This trap was designed especially for services where very large volumes of water and air must be taken care of as rapidly as possible, adding greatly to the efficient operation of the equipment upon which it is applied during the initial starting-up period.

It has a marked place in the service in conjunction with storage hot water heaters and Vento heaters where the rapid elimination of water and air is important. It is often found that an underrated or inefficient trap is placed on either of these services with the result that the equipment does not operate as efficiently as intended.

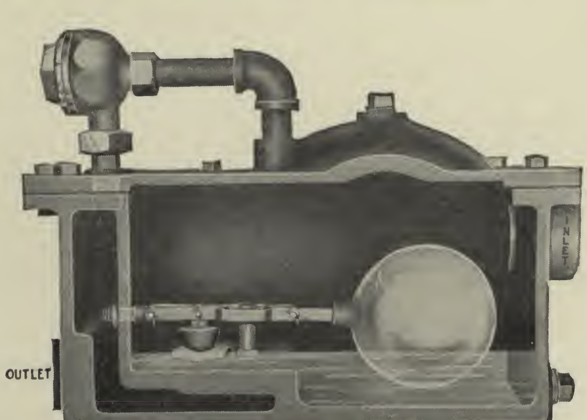
Too often the heavy duty trap is placed in service without taking into consideration that during the initial start-up periods the condensation would be much more than when the system is under normal operating conditions. For this reason we recommend that traps selected for Vento or hot water heating service be selected according to the tables on this page.

For all practical purposes the condensation on hot water heaters may be computed by considering each gallon of water to be heated as equivalent to 4.33 square feet of equivalent direct radiation and by assuming that each square foot of direct radiation will produce .25 pound of condensation per hour. A total condensation for a given size hot water storage heater may be thus estimated.

On Vento service the problem of condensation is somewhat different. On Vento two factors must be taken into consideration. First, the temperature of the outside air to be heated, and secondly, the condensation to be emitted during the initial start-up period. For all practical purposes the chart will indicate equivalent pounds of condensation to be calculated in computing heavy duty trap sizes for various outside temperatures.

Although modern methods dictate that separate air lines be incorporated on Vento to handle air only the Marsh No. 9 Heavy Duty Traps are equipped with a thermostatic by-pass to take care of any remaining air. However, for estimating purposes the air to be handled in Vento may be computed as 0.30 cubic foot of air per 100 square feet of equivalent radiation.

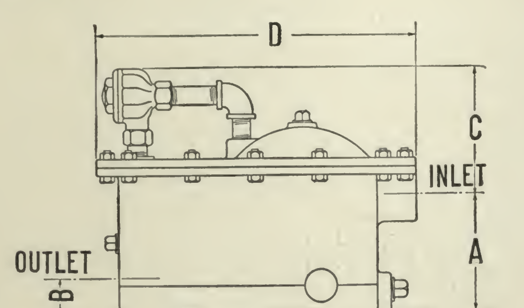
In construction the Marsh No. 9 Heavy Duty Trap is built to not only handle large volumes of water and air but is also designed to withstand heavy duty service. The body proper is of heavy cast iron, equipped with a removable cover. Extra proportions of metal are placed at the inlet and outlet stress points and it is also equipped with a plugged connection for draining. The entire float mechanism is of non-corrosive metals and so arranged to permit through passage of water. The ball float is of large proportions of heavy copper, designed to withstand pressures up to 25 pounds. The valve and valve seats are so arranged that at all times they are water sealed and likewise prevent accumulation of dirt interfering with a tight seat. As an integral part of the cover the Marsh No. 1 Series Thermostatic Trap is incorporated as a means of eliminating accumulated air. This unit is rigidly attached to the cover permitting the entire cover and thermostatic trap to be taken off should it be necessary to remove the cover for cleaning.



Marsh System Unit No. 9 Heavy Duty Trap

CAPACITIES

Size	Orifice	½ lb.	1 lb.	2 lb.	3 lb.	4 lb.	5 lb.
9-C	¾″	1800 lb.	3150 lb.	4442 lb.	5284 lb.	6249 lb.	6955 lb.
9-D	⅞″	2620 lb.	4345 lb.	6125 lb.	7435 lb.	8613 lb.	9576 lb.
9-E	1 ″	3327 lb.	5676 lb.	8024 lb.	9778 lb.	11286 lb.	12517 lb.
9-F	1⅛″	4239 lb.	7197 lb.	12303 lb.	14256 lb.	15823 lb.	22228 lb.



Spec. Symbol	Size	A	B	C	D
9-C 9-D	1 ″ 1¼″	5½″	1½″	5 15/16″	14½″
9-E 9-F	1½″ 2 ″	5⅝″	1¾″	6½″	16¼″

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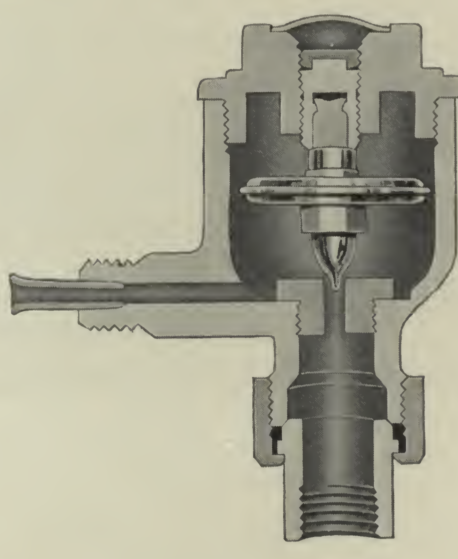
Marsh System Unit Air Line Valve



The object of this valve is to permit all air to be rapidly vented out of the radiator and supply system of air line or Paul heating systems. By so doing permitting steam to generate at low temperatures and to circulate quickly without resistance, into the entire heating system.

The valve automatically passes all air, hot or cold, but prevents the escape of steam into the air line.

Operates automatically with or without mechanical suction on the return line.

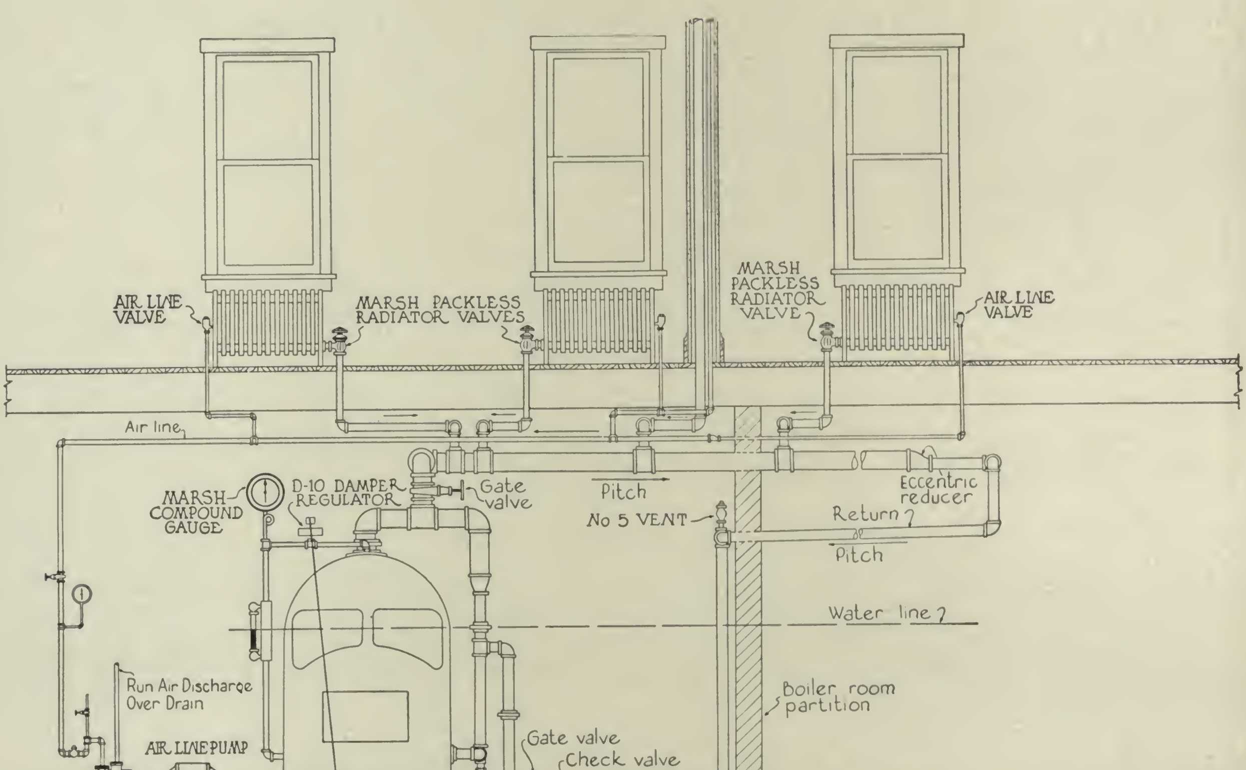
There is just one movable part in the construction of the Marsh System Unit Air Line Valve. The valve opens for air and closes for steam by means of the contraction and expansion of a phosphor bronze diaphragm containing a combination of volatile fluid. This diaphragm is similar in construction to the diaphragm of the Marsh System Unit Radiator Trap.

When cold, the valve is open. The instant steam reaches the valve the volatile fluid in the diaphragm vaporizes and expands the diaphragm closing the valve stem against the valve seat. When air is given off by condensation of steam, the diaphragm contracts and air is passed out of the valve into the air return line.

There is no water pocket in this valve. The inlet is also the outlet to the radiator and back into the system for all water of condensation. This prevents a drain on the water in the boiler and insures a dry return air line.

Valve is finished in two-tone polished and satin nickel plate.

For installation on radiators made with 1/8 inch connection to the radiator and 1/4 inch connection to the return air line. For blast coils made in two sizes, 1/4 inch male x 3/8 inch union, or 3/8 inch male x 3/8 inch union.



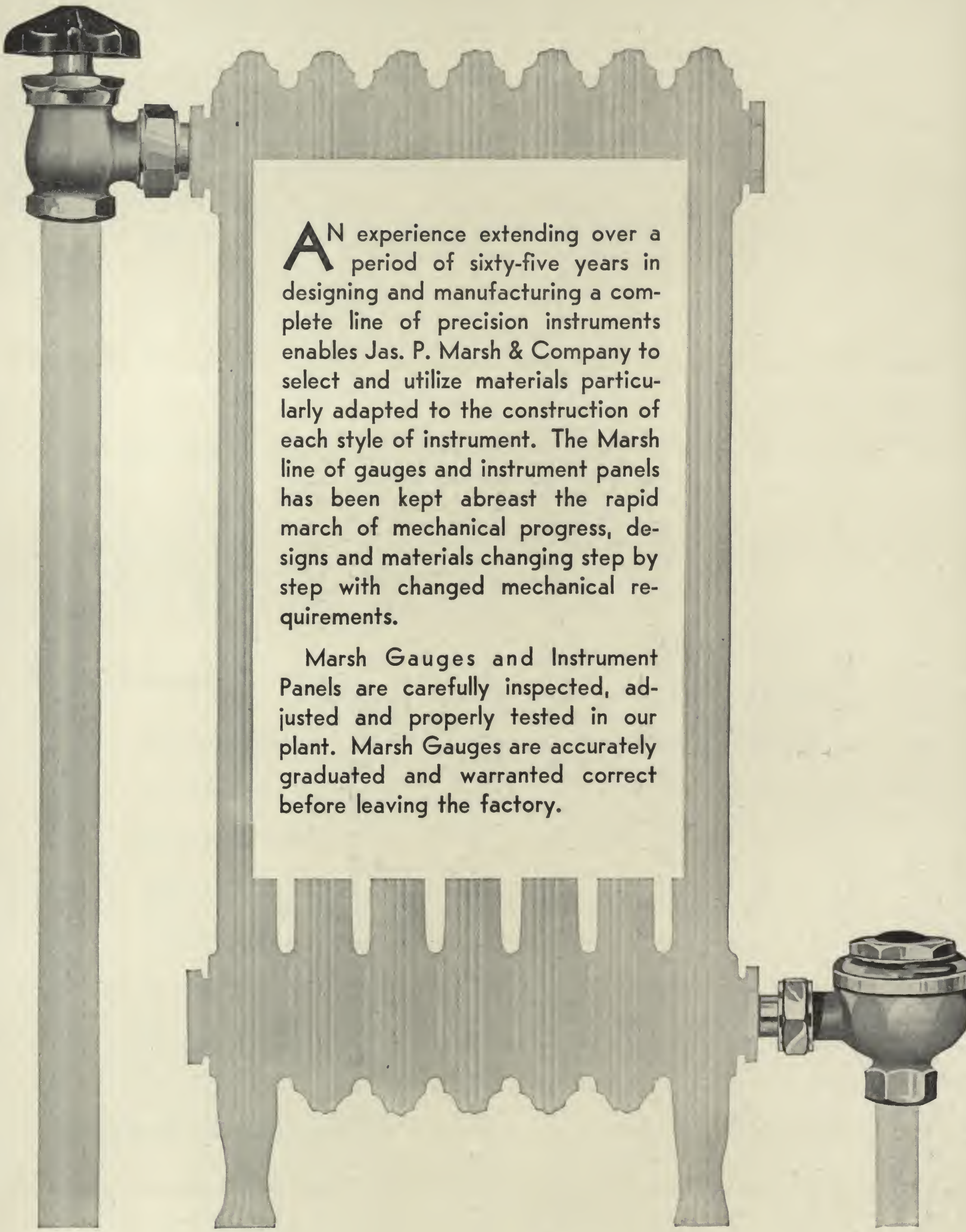
Showing Application of Marsh Air Line Valve to Air Line System

MARSH GAUGES AND INSTRUMENT PANELS

Bulletin No. 200

Indicating
and
Recording
Gauges
Clocks
and
Instrument
Panels

JAS. P. **MARSH** & COMPANY
CHICAGO



AN experience extending over a period of sixty-five years in designing and manufacturing a complete line of precision instruments enables Jas. P. Marsh & Company to select and utilize materials particularly adapted to the construction of each style of instrument. The Marsh line of gauges and instrument panels has been kept abreast the rapid march of mechanical progress, designs and materials changing step by step with changed mechanical requirements.

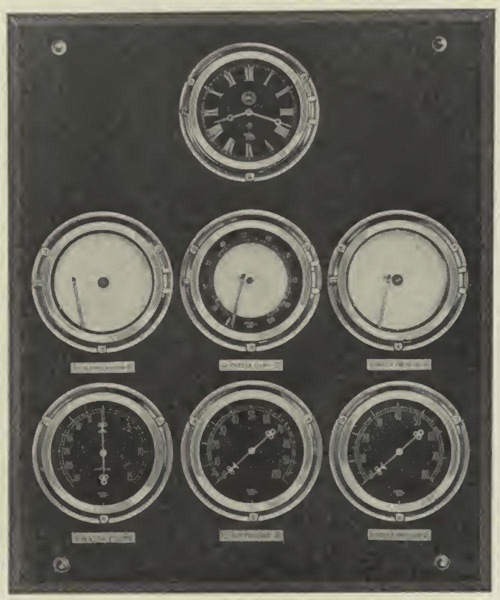
Marsh Gauges and Instrument Panels are carefully inspected, adjusted and properly tested in our plant. Marsh Gauges are accurately graduated and warranted correct before leaving the factory.

MARSH GAUGES AND INSTRUMENT PANELS

OUR long experience in producing instrument panels as kindred products of Marsh Gauges, enables us to create these panels in pleasing designs and to assure a durability and efficiency comparable to that of the instruments mounted on them.

Marsh Gauges

The Marsh line of indicating and recording gauges is complete, embracing all fields of pressure, vacuum, and altitude measurement.



Construction

Marsh Gauges (except steel spring hydraulic and steel spring refrigeration gauges) are fitted with springs of ovaliform solid drawn seamless brass tubing of proper weight, thickness and length — carefully selected and determined by experts and with the benefit of our experience of more than sixty years in the manufacture of the full and complete line of Marsh Gauges. After the springs are rolled and bent to shape, they are then treated under actual working conditions, including heat and steam for steam gauge springs. This process includes over-pressure and seasoning—producing a finished spring guaranteed against liability to set. These scientific methods produce the Marsh Gauge Spring, which, after being carefully fitted to case and adjusted to movement, completes an instrument suitable for the purpose intended and, with intelligent use, good for the life of the apparatus upon which it is installed.

The movement is made of non-corrosive materials, properly seasoned to withstand variations of high and low temperatures. All teeth in segments and pinions are cut by machinery designed specially for that purpose, assuring uniformity, smooth, even indication, and eliminating friction. The adjustment permits accuracy and precision in adjustment for even the most sensitive pressures. Movement in any style or pattern of Marsh Gauge is selected for construction, weight and materials after service requirements of instrument are taken into consideration.

Marsh Gauges are equipped with silvered dials having black figures and graduations; black dials having white figures and graduations; or with oven baked, white enameled metal dials having dead black numerals, lettering and graduations.

Marsh Gauges are with case and ring so assembled as to assure a dust and moistureproof instrument.

Marsh Instrument Panels

Marsh Panels can be furnished in a wide range of materials. They may be specified of electrical, ribbon or Monson slate, white and pink Tennessee or Alabama marble, woods of all kinds, asbestos ebony or steel plate. We recommend asbestos ebony where it is not intended to attain the beauty that marble gives. It will not crack or warp, it is immune to heat, moisture or chemicals and has great dialectric strength. Its appearance is that of highly surfaced ebony or hard rubber and its chief advantage is that it may be used in smaller thicknesses than other materials.

The growing popularity of the flush mounted type of mounting is due to the neat appearance they give to the panel surface. Only the face of the instruments and front flanges are exposed.

The surface mounted type of panel utilizes Marsh Flanged Case Instruments which are fastened to the surface of the panel by means of bolts inserted through the back flange. In this type the entire instrument is exposed on the surface of the panel but all piping and connections are concealed behind the board.

Marsh Instrument Panels may also be designed to include other types of instruments not included in the Marsh line such as flow meters, recording thermometers, electrical instruments and temperature regulation instruments and switches. Panels can be furnished with electric lighting fixtures for illumination.

On page 4 we illustrate our recommended method of mounting gauge boards. The methods there illustrated utilize piping. This construction requires no threading except for floor, ceiling and wall flanges. Ample strength, rigidity and ease of adjustment are attained.

No special work such as blacksmithing is required as in the case of angle or channel iron construction.

 Continued on next page

Marsh Gauges

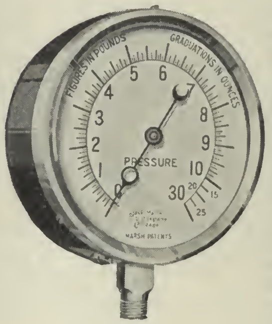
Most of the mechanical equipment, such as vacuum pumps, circulating pumps, fire pumps, heating and power boilers, oil burners, air compressors, pneumatic controlling systems, etc., entering into the construction of the fine buildings of today are equipped, by their manufacturers, with Marsh instruments. And in the same way for piping application and for instrument panels similar Marsh Gauges fill every need.

All gauges described on this and the following page are available in the following finishes:

Chromium plated cast brass case and ring, chromium plated ring with black enameled case, nickel plated cast brass case and ring, nickel plated ring with black enameled case, polished brass case and ring, polished brass ring with black enameled case, black enameled case and ring.

All gauges shown are made for either surface or flush mounted gauge board application.

Marsh Fig. 82 Low Pressure Ounce Graduated Retard Gauge

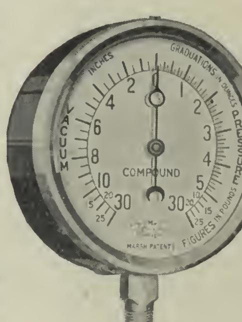


For low pressure boilers, low pressure steam lines and natural or manufactured gas pressures.

The instrument indicates pressure from 0 to 10 pounds in 1-ounce pressure per square inch intervals and with 1-pound numerical graduations. From 10 to 30 pounds indications are at 5-pound intervals. For household boilers manufactured in 3½-inch size, 4½-inch size and 5-inch size. For larger size boilers manufactured with flanged case and flared ring.

Marsh Fig. 83 Low Pressure Ounce Graduated Compound Retard Gauge

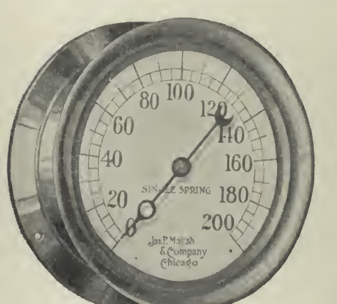
For boilers on vapor, air line, vacuum return line and one pipe vacuum systems. Also for low pressure steam lines and gas pressure lines.



This instrument being of the compound construction indicates even the first ounce of pressure. It is calibrated to 5 pounds in 1-ounce divisions and 1 pound numerical intervals in 5-pound divisions up to 30 pounds. The vacuum side is calibrated to 10 inches in ½-inch divisions and 2-inch numerical intervals to 30 inches in 5-inch intervals.

For household boilers manufactured in 3½-inch size, 4½-inch size and 5-inch size. For larger size boilers manufactured with flanged case and flared ring.

Marsh Standard Pressure Gauge



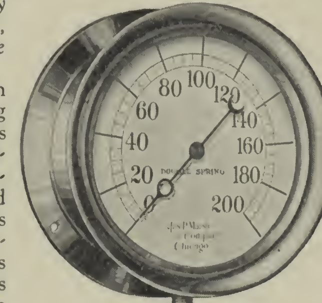
For high pressure boilers, power boilers, steam, water and air lines, circulating pumps, fir epumps and air compressors.

Manufactured in pressure ranges varying from 30 to 1000 pounds per square inch, depending upon the service application.

Manufactured in sizes 2½, 3, 4½ and 5 inches for application to equipment or pressure lines where the instruments are accessible for close reading. Manufactured in larger sizes to 12 inches for larger equipment and for high points where reading must be taken at a great distance. Manufactured in 6-inch dial and larger in flanged case, flared ring, for bolting onto apparatus or for gauge board application.

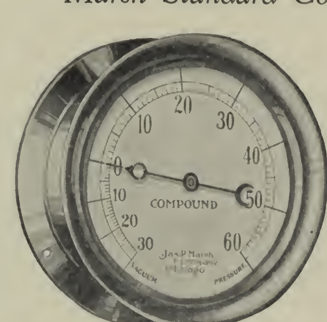
Marsh Double Spring Pressure Gauges

For heavy duty service on steam, water, gas or air lines, fire pumps, etc.



Manufactured in pressure ranges varying from 60 to 1000 pounds per square inch depending upon the service application. Manufactured in sizes 4½ and 5 inches for application to equipment or pressure lines where the instruments are accessible for close reading. Manufactured in larger sizes up to 12 inches in flanged case, flared ring for larger equipment, for high points and for gauge board application.

Marsh Standard Compound Gauge

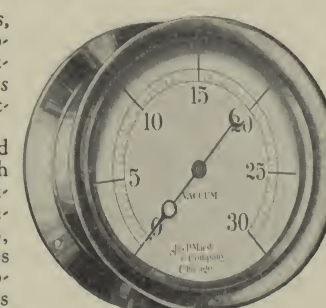


For indication of both pressure and vacuum on the same gauge for such service where both pressure and vacuum conditions occur in the same line or the same apparatus.

Manufactured in pressures from 0 to 30-inch vacuum by 0 to 15-pound pressure to 0 to 30-inch vacuum by 0 to 1000-pound pressure. Manufactured in sizes 2½, 3, 3½, 4½ and 5 inches for application to equipment or pressure lines where the instruments are accessible for close reading. Manufactured in larger sizes to 12 inches in flanged case, flared ring for larger equipment for gauge board application.

Marsh Standard Vacuum Gauges

For vacuum pumps, vacuum return line piping and process apparatus where steam is circulated under sub-atmospheric pressure.



Dial is calibrated 0 to 30 inches in 1-inch divisions and 5-inch numerical intervals. Manufactured in sizes 2½, 3, 3½, 4½ and 5 inches for application to equipment or pressure lines where the instruments are accessible for close reading. Manufactured in larger sizes to 12 inches in flanged case, flared ring for larger equipment, for gauge board application.

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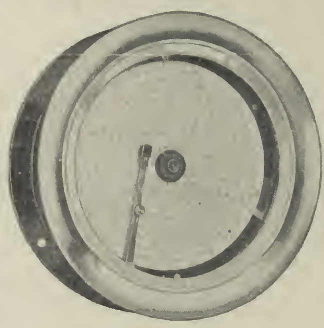
Marsh Recording Gauges

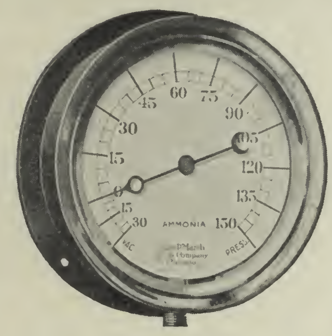


For application to all services of pressure, vacuum, altitude, or combination, where it is desired to maintain permanent record of conditions.

Furnished in round form to match Marsh Indicating Gauges and supplied in all designs, styles and finishes in which Marsh Indicating Gauges are manufactured. Manufactured in sizes 6¾, 8½, 10 and 12 inches. Supplied for wall mounting made with bottom connection and for gauge board mounting with back connection.

The Marsh Combined Indicating and Recording Gauge incorporates in the one instrument the two functions of indicating pressure, vacuum or altitude conditions and recording the conditions from the same source through one set of piping and with single connection. This instrument is specially recommended where a large number of instruments are desired and the available space limited.

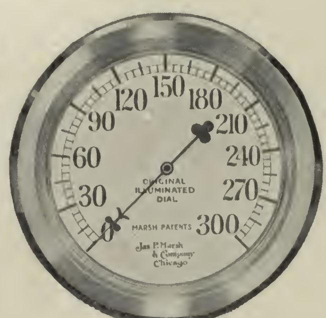
Marsh Refrigeration Gauges



For application to compressors, circulating lines or gauge board panels to indicate pressures on ammonia, sulphur dioxide, methyl chloride, carbon dioxide and other types of refrigerating equipment.

Manufactured in both high pressure and low pressure graduations for all types of refrigeration systems to indicate pressures in both suction and compression side. Manufactured in sizes 2½, 3, 3½, 4½ and 5 inches for application to equipment or pressure lines where instruments are accessible for close reading. Manufactured in larger sizes to 12 inches for larger equipment and for high points where readings must be taken at a great distance. Made in 6-inch dial and larger with flanged case and flared ring for bolting onto apparatus or for gauge board application.

Marsh Illuminated Dial Gauges

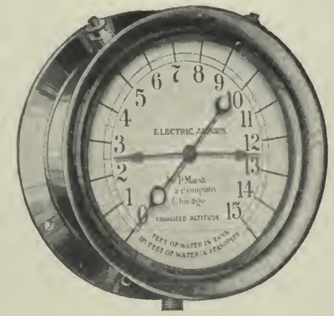


For application to all indicating gauge services on boiler fronts, as master pilot gauges or on instrument panels and eliminates necessity for electric light accessories.

So constructed with non-breakable glass dial and glass back that with electric light hung down in the gauge, all graduations, numerals and indicating hand stand out clearly in silhouette. With electric light turned off, hand and graduations show up black against the white background. As constructed in flush mounted casing and installed upon gauge boards, all that shows on the front of the board is the front mounting flange and the dial with graduations and hand. When electric light is turned on these light up in silhouette.

Manufactured in sizes 6, 8½, 10 and 12-inch dial and in all types and finishes as other Marsh Indicating Gauges are made.

Marsh Electrical Alarm Gauges



For application to sprinkler systems, tanks, water towers, standpipes, steam boilers or any other service where an instrument is required to give alarm when pressure reaches above or below a predetermined point.

Manufactured in sizes 3½, 4½ and 5 inches for application to equipment or pressure lines where the instruments are accessible for close reading. Manufactured in larger sizes to 12 inches for larger equipment and for high points where readings must be taken at a great distance. Made with 6-inch dial and larger in flanged case, flared ring, for bolting onto apparatus or for gauge board application. For application to low voltage, battery or lighting circuits to operate a bell, gong or signal light. As furnished for application to standpipes or elevated water towers can be constructed so that the indication and the electrical alarm gong operate only within the range of the tank proper.

Marsh Clocks

For use in stationary engine rooms and on gauge board panels.

Constructed with a choice of several high grade clock movements, including Seth Thomas, Boston and Chelsea. For general service we recommend and standardize upon the Seth Thomas movement.

Made in sizes 6¾, 8½, 10 and 12 inches and in all types and finishes as Marsh Indicating and Recording Gauges.

Marsh Flush Mounted Instruments

For application to gauge board panels. All Marsh instruments are obtainable in this construction. Recommended for gauge board panels where the most pleasing and highest grade of installation is desired.

Made in sizes 6, 8½, 10 and 12-inch dial and in all finishes. Can be supplied with all variations of dials. White dial with black graduations, black dial with white graduations or silvered dial with black graduations. Also made in the illuminated dial construction.

Continued on next page

Methods of Mounting Marsh Instrument Panels

Framework made of piping and fittings is recommended by JAS. P. MARSH & COMPANY as the best means of mounting instrument panels. This method is superior to angle or channel iron construction, first, because a better framework is secured and, second, because it is more easily and economically set up.

In the three recommended types of construction below 1¼-inch pipe is used. The fittings illustrated herewith and described in the table will fulfill any required position and angle of pipe in constructing a framework.

PIPE FITTINGS

For Panel and Base Mounting

Description	Fig. No.	Size of Pipe			
		A	B	C	D
End clamp for single panel or base..	1	1¼″	...	2½″	1¼″
Intermediate clamp for panels or bases	2	1¼″	...	2½″	1 9/16″
End clamp for single panel and tie rod	3	1¼″	1¼″	2½″	1½″
Clamp for horizontal and vertical pipes at right angles..........	4	1¼″	¾″	1 15/16″	2⅝″
Oval floor flange..........	5	1¼″	...	3½″	2½″
Clamp for fastening horizontal pipe to wall..........	6	1¼″	...	⅜″	2⅞″
Ball floor brace for tie rod........	7	...	...	...	...
Ball pipe brace for tie rod........	8	1¼″	...	...	...
Cap	9	1¼″	...	...	...

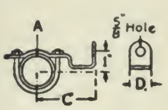


Fig. 1

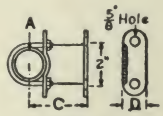


Fig. 2

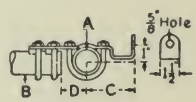


Fig. 3

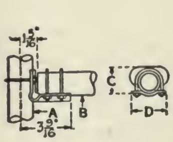


Fig. 4

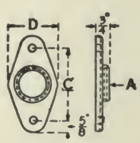


Fig. 5

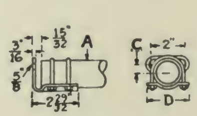


Fig. 6

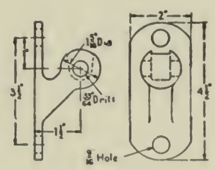


Fig. 7

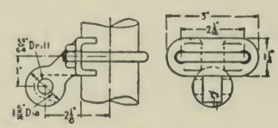


Fig. 8

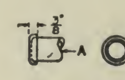
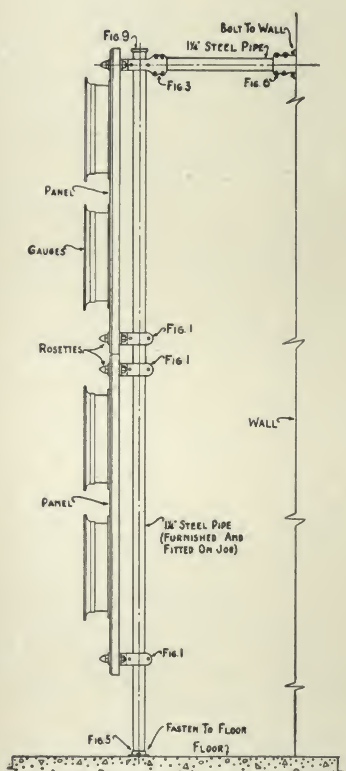
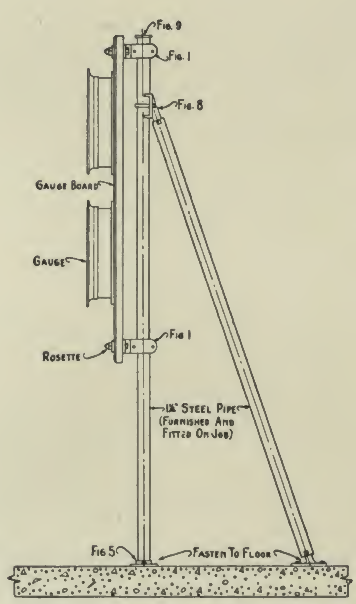


Fig. 9

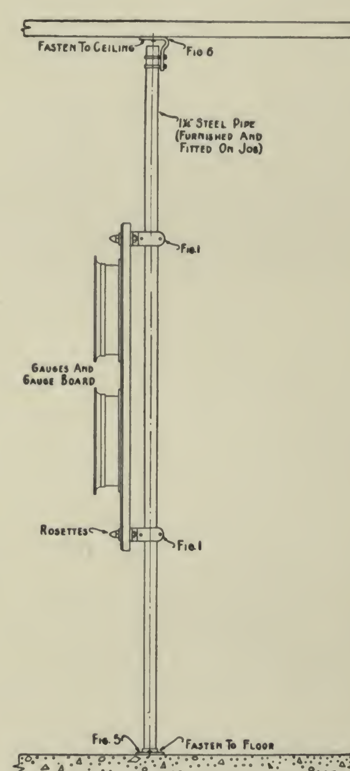
Recommended Methods of Supporting Marsh Instrument Panels



The above application of panel pipe fittings is used when a gauge board is to be located near a wall. The vertical pipe is fastened to the floor with a floor flange and extends to the height of the board, where it is connected with an end clamp and tie rod. To this another length of 1¼-inch pipe is fastened. This is bolted by a horizontal fastening clamp to the wall.



When a gauge board is away from the wall and cannot be fastened to the ceiling, the above arrangement will be found satisfactory. A vertical pipe is extended to the height of the board and is held in place by panel and clamps fastened with bolts and rosettes. This vertical pipe is braced to the floor at a desired angle with a tie rod fitting extending to the floor.

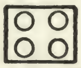
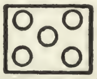
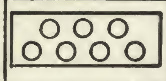
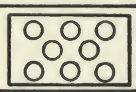
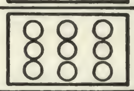
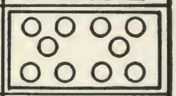
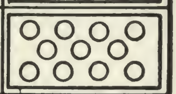
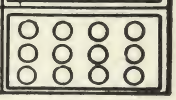


The above may be used where the ceiling is not very high. The 1¼-inch pipe is threaded at one end on which is screwed a floor flange. This is bolted through the floor. The top of the pipe is held in place by a ceiling clamp which is affixed to the ceiling.

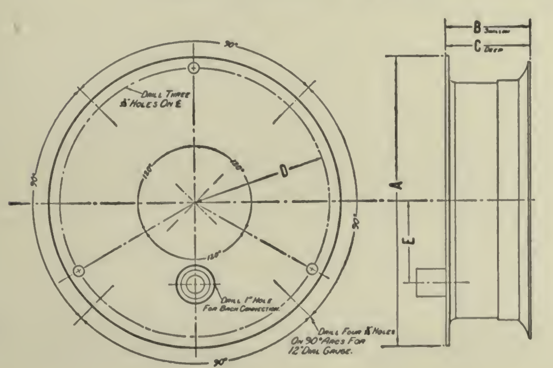
Continued on next page

Typical Layouts of Marsh Instrument Panels

The schedule given below indicates the approximate size of an instrument panel having a given number of instruments mounted thereon. For instance, should a panel require five gauges for the service intended, the gauges being 6-inch size, the schedule indicates a panel 28x28x1¼ inches thick. For special creations in panels, a tentative layout will be furnished upon receipt of specifications.

OutsideDiam.	**6½″**	**7⅝″**	**8 7/16″**	**10 1/16″**	**11 13/16″**	**14″**	**Outside Diam.**
Size of Dial	**5″**	**6″**	**6¾″**	**8½″**	**10″**	**12″**	**Layout**
Size of Board	**12″x12″x1″**	**13″x13″x1″**	**14″x14″x1″**	**16″x16″x1″**	**18″x18″x1″**	**21″x21″x1″**	
Size of Board	**21″x12″x1″**	**24″x13″x1″**	**26″x14″x1″**	**29″x16″x1″**	**33″x18″x1¼″**	**39″x21″x1¼″**	
Size of Board	**30″x12″x1″**	**34″x13″x1″**	**37″x14″x1¼″**	**42″x16″x1¼″**	**43″x18″x1¼″**	**57″x21″x1½″**	
Size of Board	**21″x21″x1″**	**24″x24″x1″**	**26″x26″x1¼″**	**29″x29″x1¼″**	**33″x33″x1¼″**	**39″x39″x1½″**	
Size of Board	**25″x25″x1¼″**	**28″x28″x1¼″**	**30″x30″x1¼″**	**34″x34″x1¼″**	**39″x39″x1½″**	**47″x47″x1½″**	
Size of Board	**30″x21″x1¼″**	**34″x24″x1¼″**	**37″x26″x1¼″**	**42″x29″x1½″**	**48″x33″x1½″**	**57″x39″x1½″**	
Size of Board	**39″x20″x1¼″**	**45″x22″x1¼″**	**48″x24″x1¼″**	**55″x27″x1½″**	**63″x31″x1½″**	**76″x39″x1½″**	
Size of Board	**30″x28″x1¼″**	**34″x31″x1¼″**	**37″x34″x1½″**	**42″x38″x1½″**	**48″x44″x1½″**	**57″x53″x1½″**	
Size of Board	**30″x30″x1¼″**	**34″x34″x1¼″**	**37″x37″x1½″**	**42″x42″x1½″**	**48″x48″x1½″**	**57″x57″x1½″**	
Size of Board	**39″x28″x1¼″**	**45″x31″x1½″**	**48″x34″x1½″**	**55″x38″x1½″**	**63″x44″x1½″**	**38″x53″x1½″ Two Panels**	
Size of Board	**39″x28″x1¼″**	**45″x31″x1½″**	**48″x34″x1½″**	**55″x38″x1½″**	**63″x44″x1½″**	**38″x53″x1½″ Two Panels**	
Size of Board	**39″x30″x1¼″**	**45″x34″x1½″**	**50″x37″x1½″**	**55″x42″x1½″**	**63″x48″x1½″**	**38″x57″x1½″ Two Panels**	

Dimensions of Marsh Instrument Panel Gauges and Clocks



The template drawing and table given below will supply the dimensions for Marsh Gauges and Clocks from 5-inch to 12-inch dial.

For clocks the 1-inch drilling for connection is omitted.

DIMENSIONS

Size	5″	6″	6¾″	8½″	10″	12″
A	6½″	7⅝″	8 7/16″	10 1/16″	11 13/16″	14 ″
B	2¼″	2½″	2½″	2¾″	3¼″	3¼″
C	3 1/16″	4 ″	4 ″	4⅛″	4¼″	4⅜″
D	3 1/16″	3 17/32″	3 31/32″	4 23/32″	5 19/32″	....
E	1 29/32″	2 5/32″	2 7/16″	2 11/16″	2 31/32″	2 31/32″

Continued on next page

Typical Specification for Marsh Instrument Panels

In the boiler room, where hereinafter directed, the heating contractor shall furnish and install one gauge board with all gauges (and clock) as shown on the plan, made of .... inch thick (material to be selected).

All instruments are to be of the (surface) (flush) mounted type. All instruments shall match in design and form.

Contractor shall mount the panel on a frame work of piping.

Note: See page 4 of this Bulletin for complete information on fittings and piping for mounting gauge boards.

Wherever the pipe connections are taken off any part of the system and run over to the gauges there shall be a shut-off valve provided near the connection as well as a shut-off cock near the gauges and a valve drip line back of the board on each connection. A total of (number ......) recording gauges and (number ......) indicating gauges, and (one clock) shall be provided as hereinafter specified.

These instruments shall be mounted on the board in accordance with layout to be made by Jas. P. Marsh & Company and submitted by the contractor to the architect for approval.

All instruments to be of Jas. P. Marsh & Company manufacture.

For each of the recording gauges this contractor shall furnish and turn over to the owners' engineer and take receipt for, a total of 400 twenty-four hour charts.

Under each gauge there shall be mounted on the board a 1 x 6-inch service plate plainly engraved indicating the service for which the gauge is used.

Note: Alternate. There shall be engraved on the face of each gauge, service for which the gauge is used.

All gauges shall be equipped with water leg and shall be back connected with no connections showing on the front of the board.

On the gauge board this contractor shall drill (number ......) openings of the size and kind as directed by the electrical contractor for the illumination of the gauge board.

All instruments shall be (chromium plated cast brass case and ring), (chromium plated ring with black enamel case), (nickel plated cast brass case and ring), (nickel plated ring with black enamel case), (polished cast brass case and ring), polished brass ring with black enamel case), (black enamel case and ring).

It is intended that the heating contractor shall make connections to all gauges to be furnished by him on the gauge board, connected to any portion of the work done by him.

The following instruments shall be furnished and installed on the gauge board:

One Marsh Clock with Seth Thomas eight-day movement.

An indicating gauge shall be connected to the main boiler pressure line and shall be graduated from 0 to 200 lb. pressure. *(Note: This gauge for high pressure only.)*

An indicating gauge shall be connected to the process steam line and shall be graduated 0 to 80 lbs. *(Note: For high pressure only.)*

An indicating gauge shall be connected to the indirect units heating system and shall be graduated 0 to 30 lb.

An indicating gauge shall be connected to the vacuum heating system and shall be graduated 15 lb. pressure by 30 in. vacuum.

An indicating gauge shall be connected to the main return header and shall be graduated 15 lb. pressure by 30 in. vacuum.

An indicating gauge shall be connected to the city water pressure supply and shall be graduated 0 to 100 lb.

An indicating gauge shall be connected to the house pump discharge and shall be graduated 0 to 100 lb. pressure and corresponding feet in altitude.

An indicating gauge shall be connected to the fire pump and sprinkler system and shall be graduated 0 to 200 lb. and corresponding feet in altitude.

An indicating gauge shall be connected to the compressed air system and shall be graduated 0 to 200 lb. pressure.

A recording gauge shall be connected to the main boiler pressure line and shall be equipped with 200-lb. charts.

A recording gauge shall be connected to the process steam line and shall be equipped with 80-lb. charts. *(Note: The above two gauges for high pressure only.)*

A recording gauge shall be connected to the indirect units heating system and shall be equipped with 30-lb. charts.

A recording gauge shall be connected to the vacuum heating system and shall be equipped with 15 lb. by 30 in. charts.

A recording gauge shall be connected to the main return header and shall be equipped with 15 lb. by 30 in. charts.

Contractor shall furnish and install on the board a name plate (4x6 in.) (6x9 in.) (9x12 in.) made of brass with stippled background and with raised lettering finished to match instruments and to be lettered as follows:

(Name of Building or Owner)
(Year)
(Architect's Name)
(Heating Contractor's Name)

The Organization Behind

Marsh System Units T.M. REG.
Marsh Heating Systems T.M. REG.
Marsh Industrial Instruments T.M. REG.

Commercial Instrument Corporation

A Delaware Corporation

▼

Subsidiary Companies

JAS. P. MARSH & COMPANY
CHICAGO, ILLINOIS
Heating Systems and Specialties. Pressure Measuring and Industial Instuments

CONNECTICUT TELEPHONE & ELECTRIC CORPORATION, MERIDEN, CONNECTICUT
Telephone and Signal Systems
Neon Light Specialties for all uses

TIFFANY MANUFACTURING COMPANY
DIV. CONNECTICUT TELEPHONE & ELECTRIC CORPORATION
Automotive Instruments, Accessories, Coils, Switches and other Specialties

THE AMERICAN PAULIN SYSTEM, INC.
LOS ANGELES, CALIFORNIA
Scientific Precision Instruments and Gauges for Airplanes and other uses

SARGENT COMPANY
CHICAGO, ILLINOIS
Special Gauges and Equipment for Railroad Locomotives and other High Pressure Boilers

CARL NORGREN COMPANY
DENVER, COLORADO
Automotive Hydraulic and Pneumatic Tool Lubricators and Couplings

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